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MUNICIPAL AFFAIRS.

It is altogether to be welcomed, this interest in municipal affairs evidenced by the meeting in Syracuse this week of the third annual convention of the League of American Municipalities. Nothing could be further from the best interests of our American cities than the apathy that treats municipal questions with indifference, and which in its way is even more harmful than the occasional outbursts of indignation, subsiding again into indifference, as though gross evils had been permanently cured by a little shouting, parading and voting. We are glad to understand that the meeting this week in Syracuse is to be well attended, and could only wish that its membership were represented not merely by some six or seven hundred city officials, but by as many public spirited citizens who neither hold office nor seek it.

This fact that the body consists virtually of officeholders must unfortunately prejudice such a discussion as is proposed this week on municipal ownership of lighting plants, street railways, etc. It is natural in every man to magnify his office, and to seek new ways of increasing power and importance. All this may be attended by worthy motives, but it is too true that in national life, as in municipal life, there is seen this steady effort after concentration of office and power and function, until freedom of action and largeness of opportunity are threatened by the development of bureaucracy, while it is not yet proved that the public gains by any superior efficiency and economy. Still, as we have said, these meetings help discussion, chiefly by means of which the facts are reached.

VARIETY IN EXPORTS.

It might be thought by any one who had not investigated the subject that the range of exports in connection with electrical work was rather limited, and that such trade was confined to a few dynamos and motors, with an occasional lamp or battery or telephone thrown in. The fact that the government returns do not go into details may to some extent justify or excuse this erroneous idea, but once in a while data is obtainable which gives a vivid idea as to the range not only of electrical apparatus that one order may include, but the range of other appliances which come in as auxiliary and incidental. In other words, while strictly electrical apparatus may be but a portion of the foreign order, electrical applications and installations are in themselves the cause of an enormous further development of foreign trade. If the reader will take the trouble to look over some of the items in our Commercial Intelligence this week, he will see this fact rather strikingly demonstrated.

While under the head of electrical exports for the week a very respectable total is shown, the proposed electric road at San Paulo, Brazil, is seen to throw nice fat opportunities in the way of the whole machinery trade and of many branches of manufacture hard to class. Yet the San Paulo project is but one of many now being pushed to completion, abroad, in which American apparatus will be required in large quantities. Other items in the same news department prove this, and indicate how great are the intrinsic merits of these new

opportunities. The rewards of those who stretch out strong hands to grasp them will be large.

We should indeed be wanting in our duty to the industrial aspects of the electrical arts in America if we did not emphasize such facts at this time. Apparatus can now be sold abroad for uses and in quantities that were not dreamed of ten, or even five, years ago. The very victory at Manila which this city will celebrate next week, while it attested the supremacy of our arms, had not less an effect in calling the attention of the Eastern world, as well as the Western, to the excellence of our products, with a few of which the victory was achieved, on its mechanical side. How best to reach the new foreign trade is something our merchants and manufacturers are now ascertaining.

Arc Lighting.

It would appear to be the growing practice among electric lighting companies to give up the supply of arc lamps to their customers. In a central station of the old school, one of the most familiar sights was the lamp room whose ceiling bristled with lamps out of service, lame, useless, under repair or awaiting hire. According to the season of the year the lamp racks would be full or thinned out, but there were, or are, always enough on hand to indicate a heavy investment. All this is said to be changing, and the customer is now allowed and required to put his own lamp on the circuit just as he buys his own motor. All the company cares about is to sell current, and it relieves itself of the heavy financial obligation due to buying lamps which may become obsolete or go out of fashion, or be objectionable to the prospective customer. It is true the gas companies supply stoves, but as a general thing they also do not bother in the least with regard to the gas fixtures and chandeliers. This change in electric lighting may bring some other interesting developments, and throw trade into the hands of local apparatus supply companies or the agents of arc lamp manufacturers. It is one more step away from the old feudal "parent company" plan of doing business in electricity.

Solidarity of Employees.

Note was made in these pages last week of the New York State Street Railway Convention and of President Rogers' shrewd observations on the waning of the bicycle and the waxing of the automobile. Such topics are of general and even popular interest, but one of the questions discussed, of more vital interest than any other, perhaps, was the relation of the companies to their employees. The discussion of this topic occupied a long time, not one minute of which was misspent. Its net result was, we are glad to note, as might be expected from such an intelligent body of men, an agreement on the principle that employees are responsive to any evidence of a desire to "treat them white"—as the phrase of the day runs. In these modern times, when the sympathetic forces of society are at once thrown heavily in favor of those who are even supposed to be treated unjustly, it is an argument of first importance to be able to show that the relationships sought to be maintained, are between man and man, and that fairness rules. It is absurd to expect that any mass of people will ever be content with their condition; Providence has happily shaped tendencies otherwise, but there must be more contentment and less complaint where every effort is made to take a personal interest in the welfare of employees. At the Ithaca meeting, Mr. Vreeland's frank and convincing description of the way in which the street car men in New York were thought of not only when well but particularly when ill, or when sickness invaded their families, explained why the attempt at a strike failed last summer. In the last Bulletin of the State Bureau of Labor, we are surprised to find a report of that affair, based on an alleged refusal to see 750 men alleged to be aggrieved and because of a willing interview with 2700 men who were satisfied and who signed a document to that effect.

Italian Hospitality.

Those who have traveled in Italy must always carry with them the most pleasant recollections of the graceful courtesy and amiability of the classic race which inhabits that beautiful country—a country moreover that has another claim for admiration from having, in its provinces from Tuscany northward, given birth to more men of genius than can be counted to the credit of any other similar area in the entire world. The recent Volta Centenary was the occasion of visits to Italy in an official capacity of a number of foreign electrical representatives, and the hospitality shown to these was of a character which more than bears out the reputation of that country for distinguished courtesy. The entertainment of the visitors included a tour, under the guidance of a committee, of the places of grand historic interest in northern Italy, and terminated with a series of festivities in Rome. One of the American telegraphic representatives writes that "No higher compliment can be paid to the skill and efficiency of the Volta Centennial committee than to say that what the Old Time Telegraphers' Association and the United States Military Telegraph Corps accomplished for the pleasure and edification of the members during the delightful reunions covering a period of three days, the Italians sustained and carried out successfully for fourteen days." This is no reflection on what Boston did last week, but it shows that the Oldest Timers are still hard to beat. The American "short story" will hardly suffice after a Boccaccian continuous performance of stately and dignified entertainments.

Evening Electrical Instruction.

It is with pleasure that we note the spread of the movement to provide means for the technical instruction of those engaged in the electrical industry who have been deprived of opportunities to obtain any electrical knowledge beyond what may be gained in their everyday work. The Young Men's Christian Association is becoming a potent factor in this field, and the so-called local institutes which frequently have been little more than reading rooms or popular lecture forums, are working for good in establishing evening classes for technical instruction. Many of these courses are admirably designed to afford the greatest benefit, particularly when their main object is preparation for the examinations for licenses which in many localities are required by employers when engaging workmen, and which system of licensing promises in time to be everywhere prevalent.

In some cases, however—possibly from lack of knowledge on the part of those in administrative charge—merely perfunctory courses of study have been instituted, consisting of academic lectures with little discrimination in the choice of subjects. While such lectures may appeal to the many who appear to delight—Chautauqua fashion—in obtaining a smattering of what may pass for knowledge and in many fields, they have little value to the man in contact with everyday practical work. Indeed, they may tend to deepen the conviction held by many practical men that an impassable gulf exists between theory and practice. If edification of the general public can not be divorced from the scheme of lectures, there ought then to be two distinct courses—one to satisfy the popular desire to know of the wonders of electricity, and the other to assist young men engaged in the industry to make their way in the world. The former class can then be regaled with sensational effects by static discharges, by X-ray exhibitions, dancing pith balls, red-hot wires, water pail forge and other applause-winning subjects; while the latter can have their speaking acquaintance with volts, amperes and ohms extended to a knowledge of their numerical manipulation, the mystery of armature and switchboard connections laid bare, and the details imparted of testing, of operation and of other necessary everyday technical knowledge.

C. G. S. ELECTROMAGNETIC UNITS.

Two communications are printed in this issue upon the baptism of the C. G. S. units; one from our distinguished French contemporary, *L'Industrie Electrique*, and signed by M. Hospitalier, and the other a communication addressed to the same paper by M. Blondel. We are heartily in sympathy with both of these gentlemen upon the main issue which they raise, and we have reason to believe that there are many engineers and physicists in this country who are also in sympathy with the proposed reform. As we have already pointed out in our editorial remarks for the issue of June 9 last, there is much to be gained by the adoption of the C. G. S. units in all practical and engineering work, instead of the awkward practical units now employed. It is needless to say that no suggestion of discredit is hereby imputed to the labors of those eminent men who created the present practical system. The criticism is the outcome of experience lasting nearly thirty years, and it is much easier to criticise after such experience than in advance of it. The only advantages, however, that the practical system of the ohm, volt and ampere possess are due to their relations with the fundamental C. G. S. units. Like the planets, they shine by reflected light. Their great objection is that if they be relied upon as a complete concrete system, they involve the use of a unit of length equal to the theoretical earth quadrant, which is absurdly too great for practical purposes; while if they are used merely as stepping stones to the fundamental C. G. S. system, their fantastic decimal ratios to those units are harassing to the memory and burdensome to the mind. Looking backwards we can conscientiously say that it now appears there never was any occasion for the creation of the practical system of units. All that was needed, after the C. G. S. system was developed, was a convenient set of prefixes to designate decimal ratios or powers of ten.

The proposal now is to give names to the C. G. S. electrical and magnetic units. There are many who used to say that no specific names were needed, and that it was sufficient to speak of a quantity as having a magnitude of so many C. G. S. units. In the first place, the human mind seems to be so organized that until a name is given to a thing, it remains in the mind as a merely abstract or symbolical conception, as distinguished from the reflection of a concrete reality. It is true that mathematicians are content to compute with quantities reckoned in C. G. S. units as abstract ideas, but even mathematicians are much hampered in expressing their ideas, when they endeavor to state the results of their computations in ordinary language, without names for these units.

The proposal to name the C. G. S. electrical units does not destroy anything which exists, or render nugatory the work of any electrical congress. It is true that if the C. G. S. units are named, they bid fair ultimately to displace the names of the practical units. But if this is true, it is all the more reason that the C. G. S. units should be christened, since so needed a reform should admit of no further delay. The petition, therefore, of a seemingly large section of the physical and electrotechnical workers is, as we understand it, addressed to the next electrical congress in the following fashion: Change nothing of the past. On the contrary, endorse everything that stands to-day for the accomplishment of past International Electrical Congresses. But give authorized names to the C. G. S. electromagnetic system of units, and suitable decimal prefixes as accessories to them, so that the C. G. S. units may be used or not as electrical workers shall elect. If the names you authorize are adopted you will have but christened quantities which were called into abstract existence some thirty years ago—quantities we all use in calculations, and on which all our practical work is based; and if, on the other hand, the names are not used, no harm will have been done and no confusion have been created.

As regards the ways and means for carrying out the proposal, we think that this is, relatively speaking, a small matter, which could be decided by a committee of the Electrical Congress which voted for the adoption of the principle. M. Blondel's original plan was to save all invention of new names and of learning new names by prefixing the syllables *ne-* or *neo-* to the practical units to obtain the corresponding C. G. S. unit, so that the *neohm* would be the name of the C. G. S. unit of resistance—the billionth of one ohm. M. Hospitalier, on the other hand, seems to be radically opposed to this idea, for the reason that confusion may be expected as soon as any attempt should be made in the future to drop the new prefix. M. Blondel, not to be discomfited by the criticism, offers in its place a complete list of seven new names for the fundamental units, and is quite ready to cast his *neo-* prefix to the four winds. For ourselves, while we are ready to accept any reasonable suggestion in the matter of nomenclature, yet we still think M. Blondel's original idea is too good to be abandoned without some further consideration. There is no doubt whatever that M. Hospitalier is right in his position that two different things should not have one and the same name. On the other hand, it is a clear duty to the electrical fraternity to make the effort to acquire the new names as simple as possible. If we use a single syllable prefix like *ne-* to designate the C. G. S. unit, we practically abolish all labor in acquiring the new terms, because no electrician who knew the use of the prefix would have to be told what a neohm was. He would know immediately that it was the name of the resistance unit in the C. G. S. system. There would be no necessity to drop the prefix *ne*, and certainly there would be no desirability of so doing until all danger of confusion should have disappeared by long-continued exclusion of the original name.

Moreover, it would be a much more pleasing and gracious task for the next Electrical Congress to authorize the use of a prefix before the names adopted by its predecessors, than to authorize a complete new list of names, while the correspondence between the practical and the C. G. S. system would be systematically maintained by the prefix. It should be remembered that a change from one set of names to another cannot be expected to be accomplished in less than five years, and it is probable that the existing practical units will continue in use to some extent for a generation to come, even if the new names were issued to-morrow. There are some conservative minds that change their ideas with as much difficulty as there are others who refuse to perceive a joke; so that a consistent relation between the C. G. S. and practical system should be retained in readiness for a long period of joint usage. We think, however, that the prefix *ne* would distinguish a C. G. S. unit from a practical unit just as clearly as the prefix *re-* distinguishes the meaning of the English word *revolt* from the international word *volt*. The only real objection that we feel toward such a prefix is the fact that it would make some of the names rather long, and an effort should be made to use names as short as possible.

In regard to prefixes, we believe that it is advisable to adopt them for decimals of the 9th, 12th and 15th positive and negative powers of ten, at least. We would suggest that for the positive powers these might be for 10^{9}, *ent-* or *ente;* for 10^{12}, *dok* or *doke;* for 10^{15}, *pend* or *pende*, from the corresponding Greek numerals; and for the negative powers they might be for 10^{-9}, *nov* or *nove*; for 10^{-12}, *dod* or *dode*; for 10^{-15}, *quind* or *quinde*, based upon Latin roots. On this basis, the capacity called a microfarad on the present system would be also called a quindefarad in the C. G. S. system. We feel convinced, however, that if the next Electrical Congress will listen to the petition for naming the C. G. S. units, this question of nomenclature may safely be left to the consideration of a committee.

The Old Timers and Military Telegraphers.

Last week at Boston, in brotherly and convivial fashion the Old Time Telegraphers' Association and the United States Military Telegraphers held their annual meeting, in Allston Hall. Over 150 members and friends were in attendance. At the Old Timers' meeting the treasurer's report showed a balance of $777.97 in the treasury. These officials were chosen: President, M. C. Hope, St. Paul, Minn.; vice-president, H. A Tuttle, Minneapolis, Minn.; secretary and treasurer, John Bryant, New York; Executive Committee, J. J. Dickey, Omaha, Neb.; James Compton, Nashville, Tenn.; S. A. Duncan, Atlanta, Ga.; E. C. Cockey, New York; W. J. Denver, Boston; S. A. D. Forestall, Boston; J. W. Larish, Grant H. Yetman, Boston; E. A. Smith, Boston. It was voted to hold the next convention in St. Paul-Minneapolis, on the third Tuesday, Wednesday and Thursday in September, 1900. Then the convention adjourned.

Immediately following the Old Timers' session, the convention of the Society of the United States War Telegraph Corps was called by Col. Wilson, its president. In a 15-minute address he put forward a powerful plea on behalf of the operators who held the perilous position of field telegraphers during the war. He pleaded for recognition among the nation's defenders, and prophesied that such recognition was slowly but surely coming. He also called attention to the National Monument Association, whose object is the erection, in Washington, of a fitting memorial to the soldiers, sailors and marines who served during the civil war.

A pledge of allegiance to this latter cause was immediately taken by the society in a resolution to that effect.

Louis M. Chasteau, of Philadelphia, and Henry C. Sherman, of Boston were admitted to membership. The treasurer reported a balance of $38.27 in hand. It was voted to meet next year with the sister society, in St. Paul-Minneapolis. The following officers were elected, after which the meeting adjourned: Col. William B. Wilson, Philadelphia, Pa., president; William L. Ives, New York, vice-president; J. E. Pettit, Chicago, Ill., secretary and treasurer; Executive Committee, E. Rosewater, chairman, Omaha, Neb.; A. H. Bliss, Chicago, Ill.; A. B. Chandler, New York; W. R. Plum, Chicago, Ill.; George C. Maynard, Washington, D. C.; D. Wilmot Smith, Breckenridge, Minn.; R. B. Hoover, Springfield, O.; L. A. Somers, Cleveland, O.; J. D. Cruise, Kansas City, Mo.

There were a great many trips, entertainments, etc., during the week. One of the excursions was to the house at Charlestown, Mass., where Prof. S. F. B. Morse was born. On Sept. 13 the two societies journeyed to Rockport as the guests of George G. Ward, vice-president and general manager of the Commercial Cable Company, and inspected the workings of the company's terminal station at that place. In the evening theatre parties kept the visitors entertained, and on Sept. 13 there was a day's sail down the harbor and the annual banquet in the evening at the Hotel Vendome. The attendance at the conventions represented 25 States.

The Edison Convention in Philadelphia.

We gave last week a brief account of the opening in Philadelphia of the convention of the Association of Edison Illuminating Companies, and a list of those present, etc. In addition to the work then mentioned as done the first day, papers were read by C. R. Price on "Relation of Cash to Current;" Alex. Dow, "Residence Lighting in Detroit;" A. S. Knight, "The Wright Meter in Boston;" G. Semenza, of Milan, Italy, "Polyphase Transmission and Distribution;" H. A. Wagner, "Use of Alternating Current for the Extension of Central Station Supply and for General Distribution;" F. M. Kimball, "Methods of Meter Sales;" E. A. Leslie, "The Kern Gas Burner;" C. D. Haskins, "Notes on Metering at Home and Abroad;" F. R. Jenkins, "The Electric Automobile." Mr. J. W. Lieb, Jr., of New York, was elected president.

The programme of entertainment prepared for the twentieth convention of the Edison Illuminating Companies at Philadelphia, last week, which was provided by the Edison Electric Company, of that city, was of an exceptionally enjoyable character. The theatre party at the Chestnut Street Theatre and banquet at the Hotel Bellevue, on Wednesday night, at which there were about 120 delegates and guests, was very enjoyable. Mr. Joseph B. McCall, of the Pennsylvania Manufacturing, Light & Power Company, presided at the banquet, entertained the company with a felicitous speech, and sang the song, "Brown October Ale." Vice-President Stetson, of the association, returned the thanks of the delegates and ladies accompanying them, for the most hospitable entertainment received. Calls were made for remarks by General Griffin, of the General Electric Company, who was present.

General Griffin, after congratulating them on the excellent spirit of concord which prevailed among the members, went on to speak on the point which had been raised by Mr. McCall, viz., the part played by the electrical engineers in assisting the government during the late war with Spain. He was glad to be able to tell them that many engineering officers in the United States Navy had since spoken to him in appreciation of the work done by the volunteers who came forward to assist in laying submarine mines for the protection of the harbors along the eastern coast and in erecting apparatus on land which required electrical skill. The suggestion originally came from Mr. Caryl D. Haskins, of Boston, who organized a corps of electricians for Boston Harbor to carry on the work under the superintendence of the engineer officers of the United States Army, who had charge there. Other corps were formed in other cities along the coast, particularly in New York, Philadelphia and Baltimore; and one United States engineer officer had remarked to him how easily and how efficiently these volunteers had done this work. He had replied that this was not strange, because it was in this case the army engineers who had been the amateurs, while the volunteer electricians had been the professionals, being accustomed to handle currents of much higher potential and to lay cables under water, as their daily work. He was also glad to be able to say that in all these volunteer corps, the employees of the various Edison companies had been prominent. Two of the volunteers, while at work on the defenses of New York Harbor, were run down by a French steamer and lost their lives. One of these men was an employee of the New York Edison Company. He felt sure that all those present would agree with him that these two men had as truly offered up their lives for their country, as if they had been among those who fell at the charge of San Juan Hill.

On Thursday afternoon all in attendance at the meeting took a tally-ho drive through Fairmount Park, up the famous Wissahickon Drive and to points of interest in the park. The local committee of ladies was made up as follows: Mrs. Martin Moloney, Mrs. Joseph B. McCall, Mrs. W. P. Conover, Jr., Mrs. A. J. DeCamp, Mrs. J. H. Vail and Mrs. W. H. Johnson.

Opening of the National Export Exposition.

A grand chorus of 600 voices opened the ceremonies of the National Export Exposition at Philadelphia on Sept. 14, accompanied by the United States Marine Band, which the government gave special permission to leave Washington for participation in the opening of the Exposition, and by the grand three-manual pipe organ which was especially erected in the Exposition's great Auditorium.

In view of the national and international scope of the Exposition and the fact that so many representatives and visitors from foreign countries were present at the opening, it was decided to make the ceremonial character and impressiveness of the occasion in keeping with the importance of the event and something to be remembered. More than 6000 people were in attendance. Opening speeches were made by Vice-President Foulkrod and the governor of Pennsylvania.

A great many of the exhibits are still in a state of incompletion, but everything is rapidly taking shape. The Exposition buildings and grounds are lighted, first, by the series arc lamp; second, by enclosed arc lamps on incandescent circuits, either alternating or direct current; third, by electric incandescent lamps; fourth, by Welsbach gas lamps; fifth, by gasoline lamps with Welsbach burners; sixth, by the Kitson system of gasoline lighting.

The National Export Exposition will afford the first general exhibition of automobiles in America. On the west side of the Main Building a beautiful smooth driveway has been constructed expressly for automobiles, on which trials of speed and comparative tests by horseless carriages will be made daily. Several manufacturers of vehicles in Philadelphia, New York, Boston and elsewhere will make exhibits, showing the application of gasoline, electricity and steam as the motive power.

The Committee of Councils, co-operating with the management of the National Export Exposition, has well in hand a plan for illuminating the City Hall during the progress of the big industrial show on lines more novel and elaborate than ever before attempted.

An Oerlikon Electric Mining Plant in Southern California.

TO the west of the Gulf of California, in about 27 degrees north latitude, is situated Santa Rosalia (Fig. 1), and the administrative headquarters of the Compagnie de Boleo, a French company owning large copper mines in the vicinity, producing in the neighborhood of 12,000 tons of pure copper per year. Close by the seashore are the smelting works, consisting of seven water-jacketed furnaces, and also workshops, warehouses, etc. The mines are situated twelve miles in the interior of the country.

The climate of Santa Rosalia borders on the tropical. Rain is rare, years often passing without any rainfall. On the other hand the climate is very frequently, and especially in the spring, humid and hot. There is an almost entire absence of fresh water and vegetation. Water for household use and for feeding boilers is brought by a pipe line ten miles in length. Coal for boilers and the coke necessary for smelting purposes are brought by sailing vessels from England and Germany.

Owing to the unfavorable conditions existing as to water, the high price of fuel, and also to a need of increased power at the mining points, the company was obliged to take under consideration a more economic method for the distribution of power than was inherent in the use of portable engines placed near the shafts and elsewhere. Finally in 1895 the company commissioned the Oerlikon Works to install an electrical plant for the distribution of power in and about the mines.

In order to reduce to the lowest point the expenses of transportation, and in order to utilize water from the sea for condensing purposes, it was decided to locate the generating station at the seashore.

The boiler plant consists of fifteen cylindrical boilers, each with three cylindrical steam drums, the capacity of each boiler being 2200 to 2600 pounds per hour of dry steam. The length of the boilers is 28 feet, and the diameter 4 feet, that of the steam drums being 20 inches. The pressure carried is 125 pounds. There are four feed pumps, one of which is held in reserve. The boilers are connected in groups of five, thus forming three batteries, and each battery has an economizer and a wrought iron chimney 100 feet high. On account of the absence of rains, the boilers are erected in the open air without cover.

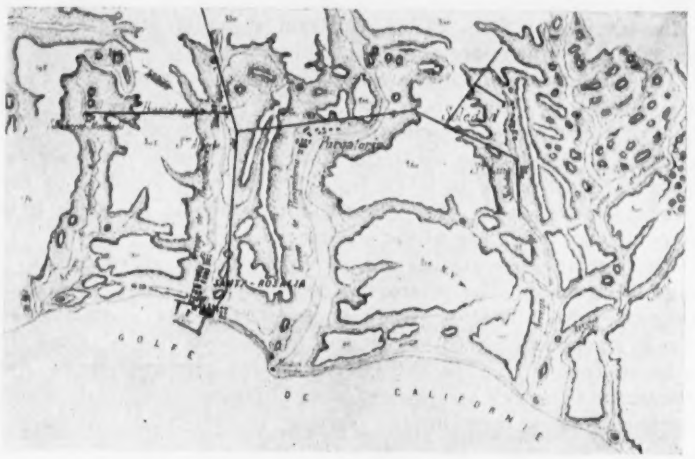


FIG. 1.—MAP OF SANTA ROSALIA, SHOWING TRANSMISSION LINE.

In the engine room (Fig. 2), there are at present four steam engines, two of 250-hp and two of 500-hp, all of the compound type, with Sulzer valves and exhausting into a surface condenser. The first mentioned make 80 r. p. m., and drive dynamos of corresponding power by means of ten cables two inches in diameter. The stroke of the pistons is 40 inches, and the diameters of the cylinders 23

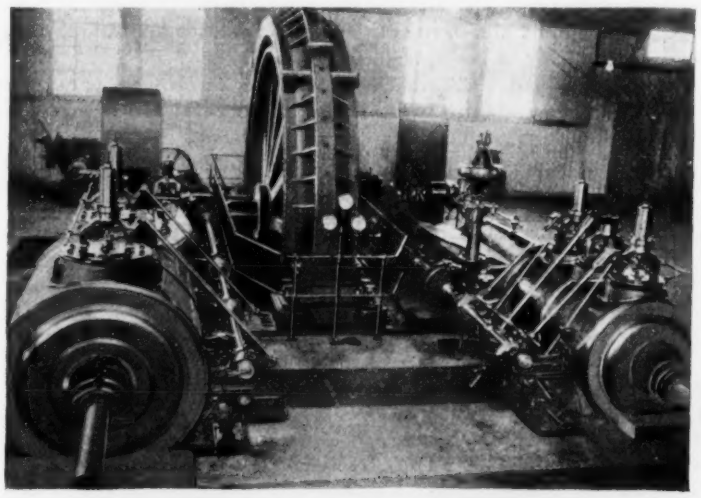
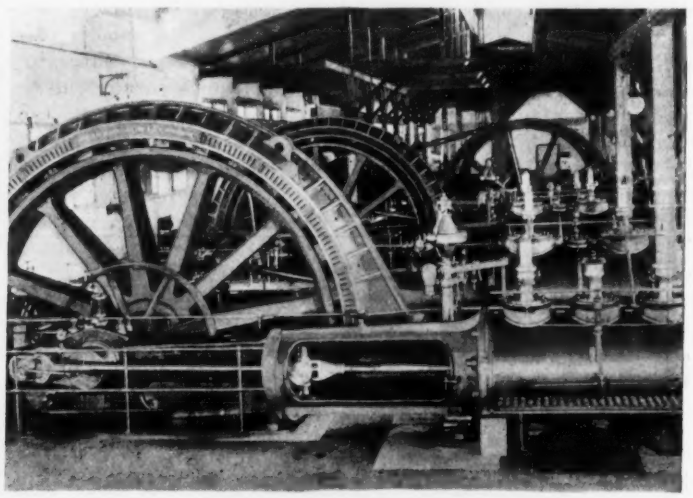
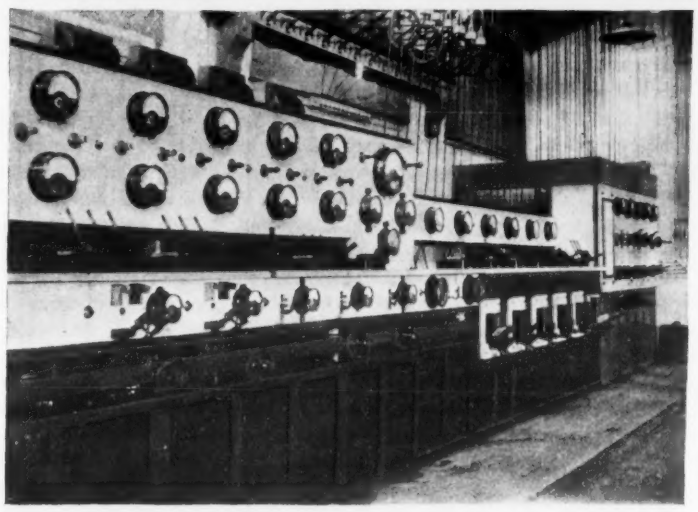


FIG. 3.—SWITCHBOARD.



FIGS. 4 AND 5.—500-HP GENERATOR.



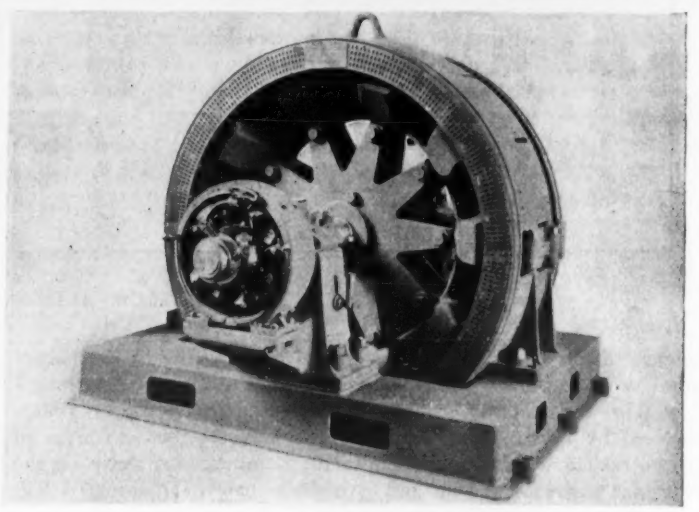


FIG. 6.—250-HP GENERATOR.

and 25 inches, respectively. The 500-hp engines are direct-connected to three-phase generators and run at 84 r. p. m.; the piston stroke is 48 inches, and the diameter of the cylinders 23 and 25 inches, respectively. The admission pressure is 120 pounds. The cylinders have jackets, to which steam at boiler pressure is admitted. The cranks are at an angle of 90 degrees.

The air pumps, which are placed below the engine room floor, are worked by levers from the engines and communicate with pumps which pass the condensed water through coke filters previous to its being again fed to the boilers. The water necessary for surface condensation is taken from the sea and supplied to the condensers by means of a steam pump, which at the same time furnishes water for use in the smeltery, etc.

The three-phase machines are the inductor type, all of the windings being fixed. The pressure is 3000 volts per phase, or a total of 5200 volts. The frequency is 42 periods per second. The 250-hp machines (Fig. 6) run at 250 r. p. m., have three bearings and a hemp rope drive. In the interior of the cast steel frame and concentric therewith are two cylinders of laminated soft iron which contain slots in their interior surface, in which are placed the armature windings. There are sixty coils, and each coil contains 36 turns. Between the two soft iron cylinders is the field coil, which is supported on a bronze ring surrounding the shaft; it consists of 320 turns of insulated wire of about No. 3 B. & S. gauge.

The inductor is a cast-iron wheel 40 inches in diameter, carrying on its rim ten pairs of laminated iron poles. The exciter is mounted directly on the generating shaft. The total weight of one of these generators is sixteen tons.

The direct-connected 500-hp generators (Figs. 4 and 5) are of the fly-wheel type and run at 84 r. p. m.—the speed of the engines. The frame is of a construction similar to that of the smaller machines, and placed on a line running between the two cylinders of the steam engine; it is mounted on slide rails, which permit it to be moved for cleaning or repairs. By means of screws the frame can be easily centred. There are 180 coils, each consisting of 27 turns. The interior diameter is 16 feet. The field coil is, as in the case of the smaller machines, placed between the two armature cylinders of soft iron. It is supported by a bronze ring having a T section, the winding, consisting of 150 turns of copper ribbon insulated by mica paper, being divided between the two sides of the central rib. The fly-wheel inductor is mounted directly on the shaft of the steam engine and carries 30 pairs of laminated soft iron inductor poles. The fly-wheel has interior gear teeth, which are engaged by a pinion operated by a small turning engine. The exciters are mounted on the generator frame, and run by means of pulleys from the shafts of the machines. The complete weight of one of these generators is 54 tons, of which 22 tons are in the fly-wheel.

Owing to the large size of one of these generators—18 feet in diameter—the windings were put on after the machine had been installed in place. The efficiency of the smaller machines is 92 per cent., and that of the larger ones 94 per cent., with a phase difference of .85.

The switchboard (Fig. 3) is 35 feet long, and contains provision for six machines and six distributing lines, of which three are for Santa Rosalia and three for the mines. Each machine is supplied with the necessary apparatus for regulation and control, and each distributing line has a switch, ammeter, fuses and lightning arrester. The entire installation has been limited to essentially necessary apparatus and devices in order to avoid complication, owing to the character of the operating personnel.

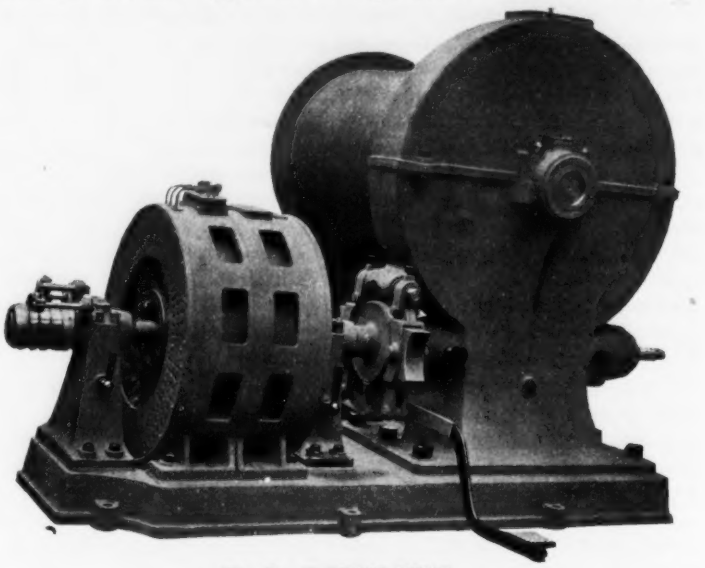


FIG. 7.—ELECTRIC HOIST.

The large and small machines can be thrown in parallel or separately connected to two systems of bus bars; and it is possible to feed any distributing line from either system.

The distributing lines are bare wire mounted on double petticoat porcelain insulators. The length of the lines is 18 miles and the length of wire 80 miles.

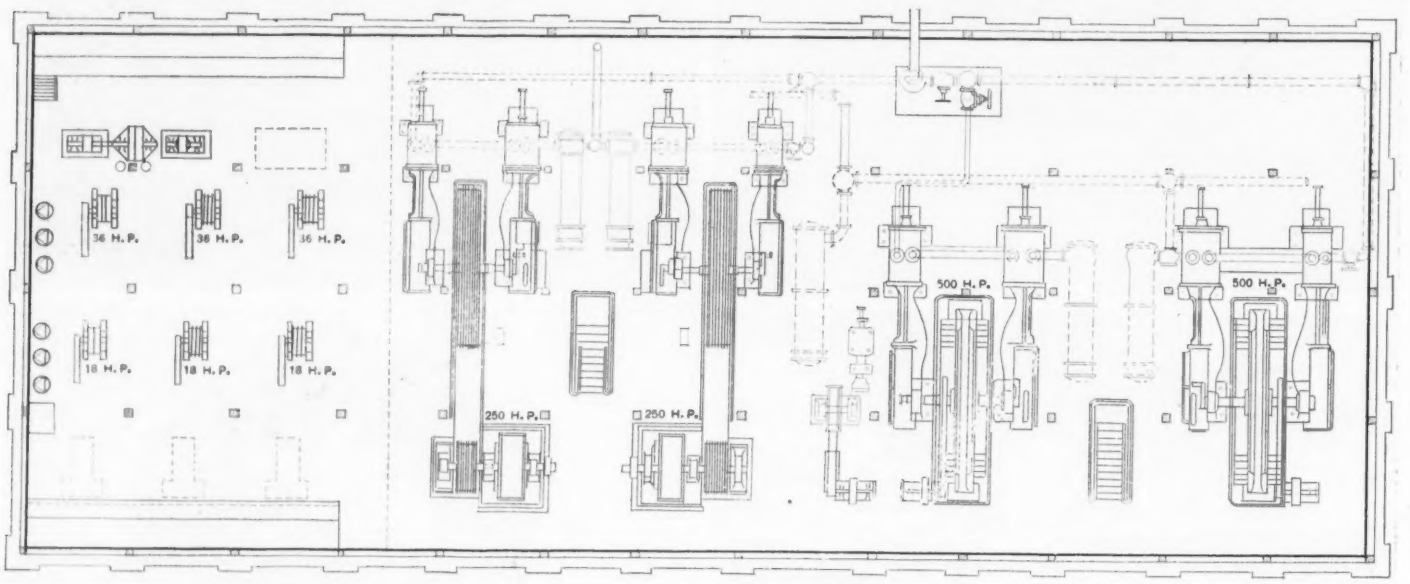


FIG. 2.—PLAN OF GENERATING ROOM.

The high tension current is stepped down at transformer substations from 3000-5200 volts to 220-380 volts. The transformers are installed, according to circumstances, singly or in substations containing up to six transformers. The large stations are two stories high, with the switchboard on the ground floor and the transformers on the floor above. Each substation is provided with lightning arresters, switches and fuses, and the connections are such as to permit of throwing out of circuit any transformer.

The transformers have three laminated iron cores on which are placed the primary and secondary coils. There are in all four types of transformers—of 50, 30, 15 and 10-kw capacity. Each motor has its own transformer, or in case any one of these four types does not correspond to the capacity of the motor, two of a

smaller capacity are used. By this arrangement the capacity of the transformers corresponds to that of the motors, thereby increasing the efficiency of the installation. The transformers are installed close to the motors in order to avoid long secondary lines. Those for the motors in the mine workings, used to run pumps, interior hoists, small ventilators, etc., are placed in the same station with the other transformers.

The secondary lines are of insulated wire mounted on porcelain insulators, or consist of three-conductor cables armored with steel wire. These three-conductor cables are installed in lengths of 325 feet, the junctions being made in a junction box, which simplifies testing for faults. The use of these cables has been particularly advantageous in connection with motors which are often shifted.

The motors are used to run ventilators, pumps, mining machines, hoists, and for various other mining purposes. Eighty-four motors in all are installed, having an aggregate horse-power of 1630. The motors are wound for 220-380 volts. Those up to 12-hp have short-circuited rotors and no starting devices; those for 12-hp and above, and the smaller ones running hoists, are supplied with starting devices in the armature circuit. For lighting the interior of the mines, current is taken from the same transformers that supply the motors.

For the lighting of Santa Rosalia—for which 60 arc lamps of 6 and 12 amperes and about 500 incandescent lamps are used—direct current is employed, as it was found impossible to obtain a sufficiently regular voltage from the three-phase circuits, owing to irregularities due to the starting up of motors supplied from that circuit. At the central station there is installed a high-tension three-phase motor direct-connected to two Oerlikon direct-current machines. The lighting current is distributed through a three-wire network at a voltage of 220 between the outers.

The direct-current switchboard forms a part of the main switchboard. The arc and incandescent lamps are on separate circuits. A throw-over switch permits of the incandescent circuit being fed by either direct or alternating current.

The two 250-hp machines, the transmission lines, as well as a part of the motors and transformers, were put in operation in 1896; the lighting in the spring of 1897, and the two 500-hp generators at the commencement of 1899. The electrical part of the installation was furnished by the Oerlikon Company, the steam engine by the Maison Sulzer Frères, of Winterthur, and the boilers by the Societe Alsacienne de Construction, of Mulhouse.

The Determination of Standards of Conductivity.

BY HENRY P. HARTH.

DURING several years' experience with Willyoung conductivity bridges, for both copper and galvanized iron, the writer has had ample opportunity to observe the sources of error due to the method now so generally used. In the first place, determinations made with this type of bridge are based on the assumption that the bridge is giving results that are correct, depending entirely on the accuracy of adjustment. While great reliance can be placed upon the accuracy of the instruments when they leave the manufacturers, we have no definite data as to the permanency of copper for standards of resistance, nor have we any means of detecting any changes that might take place, due to the physical properties of copper, or mechanical changes, due to warping of the base of the instrument.

In the second place, while it is true no temperature corrections are necessary, yet it is very seldom that the temperature of the bridge, shunts and sample bars under test, are all equal, the only condition under which the above holds true. The difference in temperature may be caused by the heating due to the testing current, especially when a number of determinations are made in succession, the heat given off by the person testing, and temperature changes of the room. When the high temperature coefficient of copper is taken into consideration, this source of error becomes evident.

In the laboratory at the John A. Roebling's Sons Company's works, Trenton, the Willyoung bridge is given its proper name, "The Comparison Bridge;" in other words, the bridge is only used for comparing unknown samples with a standard bar of known weight, length and conductivity. There are four bridges in use at present, for measuring both galvanized iron and copper, with standard bars for each. These bars are handled very carefully and replaced every two weeks with fresh bars, of which quite a stock is kept on hand.

As the Willyoung conductivity bridge has been rather fully described in an article of the *Electrical World*, Nov. 13, 1897, this will be confined to a description of a new apparatus, and of the method used in the Roebling laboratory for determining standard bars of known conductivity.

The method falls back on the standard ohm for its base of comparison. Fig. 1 gives the general scheme in which S is the standard ohm; X the sample of copper under test; A and B two arms of any bridge or rheostat in which the coils need only be proportional or accurate among themselves; M, M, M, mercury cups. All battery and galvanometer connections are made in such a way as to throw all contact resistances into the high arms of the bridge; for instance, the contact resistance of the galvanometer would be thrown into arms A and B, both of which have fairly high values, and the battery contact into the standard ohm, which is of fairly high resistance as compared with X.

Fig. 2 represents the apparatus used in practice. C is a reel, the barrel of which is made up of eight sections, spaced to leave openings between the staves, so as to allow a free circulation of air; B is a reel similarly constructed and sliding over the outside of C; D is an asbestos-lined, zinc case with an opening in the top for a standard thermometer; A is an open space large enough to contain a standard ohm, and E are the terminals of the switchboard, to be connected to any standard bridge or rheostat.

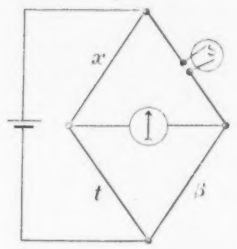
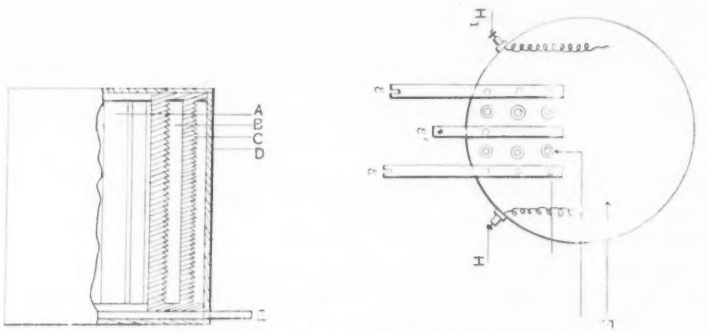


FIG. I.—DIAGRAM OF CONNECTIONS.

The whole apparatus is fairly airtight and rests upon the base containing the switchboard, in which E' are terminals, having four mercury cups each; E_1 a galvanometer terminal, H, H flexible terminals to the battery, F, base of hardwood. From the description and sketch it will be seen that the construction of the entire apparatus is such as to allow a free circulation of air. By placing the standard ohm in the space marked A, Fig. 2, it will be under the same temperature conditions as the rest of the apparatus.

Having given a full description of the apparatus, we will now look into the method of using the same. While, as stated before, all measurements are based on the standard ohm, it is only used to determine the secondary standards; in other words, the standard ohm bears the same relation to the secondary standards, as the amyl-acetate standard lamp bears to the standard incandescent lamp, in incandescent lamp photometry.

The run of wire under test ranged from No. 6 to No. 12 B. & S. 6. A 50-ft. sample each of commercially annealed copper wire No. 6, No. 10, and No. 12, was taken, the length being very accurately measured; the ends of the samples were then soldered to mercury cups, and placed in an oil bath, remaining in the bath for about 18



FIGS. 2 AND 3.—ARRANGEMENT OF APPARATUS.

hours, the temperature of the room being maintained constant and readings of the temperature of the bath taken repeatedly.

The method employed in making the resistance test is diagrammatically shown in Fig. 1, in which all contact resistance are taken care of and do not enter, the only important factor requiring con-

sideration being the temperature due to the high temperature coefficient of copper.

These measurements were made Jan. 7 to 10, 1897, and the conductivity figured according to the formulæ.

$$G = \frac{b\,l^2\,c}{W\,R} \text{ in which}$$

G = conductivity; b = resistance of metre gram of copper at 70° F.; l = length of sample under test; C = a constant when l is in feet and W in lbs.; W = weight of sample (1); R = resistance of l at 70° F. or 21.°1 C.

Test of Sample No. 6, B. & S. (Logarithmic characteristics discarded.)

b = .15366	= log. .186559	W = 4.1413	= log. .617137
l = 50	= log. .698970	R = .01921	= log. .283527
l = 50	= log. .698970		.900664
G = .0002048	= log. .311330		
	.895829		
	.900664		
	.995165 = 98.89% conductivity.		

Test of Sample No. 10, B. & S.

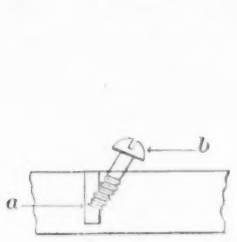
b = .15366	= log. .186559	W = 1.615	= log. .208173
l = 50	= log. .698970	R = .04929	= log. .692759
l = 50	= log. .698970		.900932
G = .0002048	= log. .311330		
	.895829		
	.900932		
	.995165 = 98.89% conductivity.		

Test of Sample No. 12, B. & S.

b = .15366	= log. .186559	R = .08339	= log. .921114
l = 50	= log. .698970	W = .9584	= log. .981544
l = 50	= log. .698970		.902658
G = .0002048	= log. .311330		
	.895829		
	.902658		
	.993171 = 98.44% conductivity.		

The above samples were now stored away to season, and to allow any time change to take place; during this period of time, the new apparatus described above and shown in Figs. 2 and 3, called the conductivity standard bridge, was designed and constructed, doing away with the many objections to the oil bath.

The second set of measurements was made about two years later, upon the same samples, using the conductivity standard bridge. The scheme of connections being the same as used in the first test, except the method of connecting the copper wires to the mercury cups. Instead of soldering them a novel scheme suggested itself which is



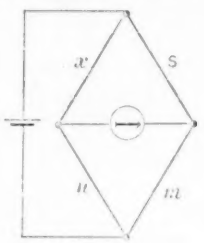


FIG. 4.—WIRE CONNECTION.
FIG. 5.—ARRANGEMENT OF APPARATUS.

shown in Fig. 4, where a is a hole drilled of such a diameter as to allow the given sample to fit loosely, and b is a round head steel screw which clamps the wire at an angle.

The reason for using this method was due to the small space available in the apparatus, and it being necessary to make all connections from the top, on account of the arrangement of the switchboard.

The cup a is first amalgamated, and then a small globule of mercury is dropped into the same, after which the end of the wire to be clamped is amalgamated, and when pushed in place is held by means of the screw b.

The following are the actual results obtained in the second determination, using the formula,

$$G = \frac{b l^2 m}{W n \left(S + \left[.00032\,(d - 16.9)\right]\right)\left[1 + (K - p)\right]}$$

where b = resistance of 1 metre gram of copper at 21.1° C., or 70° F.; l = length in feet of sample under test; c = constant when l is in feet and W is in lbs.; m = resistance in ohms of the variable arm of the bridge; w = weight in lbs. of length l; n = fixed arm of bridge in ohms; s = the Standard Ohm correct at 16°.9 C., having a temperature coefficient .00032; d = the temperature of bath or apparatus in $OC.$; k = temperature coefficient for 21°.1 C., or 70° F.; p = temperature coefficient of d degrees.

Test of No. 6, B. & S.

$$\left(1 + \left[.00032(17°.0 - 16°.9\ C.)\right]\right)\left[1 + (1.08419 - 1.06745)\right] = 1.01677$$

b = .15366	= log. .186559	d = 17°.0 C.	
l^2 = 2500	= log. .397940	S = 1	
c = .0002048	= log. .311330	k = 1.08419 log. 1.01677	= .007194
m = 5295	= log. .723866	p = 1.06745 W = 4.1413	= .617137
	.619695	W = 4.14130	.624331
	.624331	n = 100	
	.995364 = 98.94% conductivity.		

Test of No. 10, B. & S. Temperature of apparatus, 17.9 C.
Weight of 50 ft. sample, 1.615 lbs.

log. b = .186559	m = 2056 ohms.	
log. l^2 = .397940	n = 100 ohms. log. 1.0134	= .005781
log. c = .311330	S = 1 ohm. log. 1.615	= .208173
log. m = .313023		
	d = 17°.9 C.	.213954
.208852	k = 1.08419	
.213954	p = 1.07111	
.994898 = 98.83% conductivity.		

$$\left(1 + \left[.00032(17°.9\ C. - 16°.9\ C.)\right]\right)\left[1 + (1.08419 - 1.07111)\right] = 1.0134$$

Test of No. 12, B. & S. Temperature of apparatus, 17.5 C.
Weight of 50 ft. sample, .9584 lbs.

log. b = .186559	m = 1217 ohms.	
log. l^2 = .397940	n = 100 ohms. log. 1.0149	= .006422
log. c = .311330	S = 1 ohm. log. .9584	= .981547
log. m = .085291		
	d = 17°.5 C.	.987969
.981120	k = 1.08419	
.987969	p = 1.06948	
(.993151		
(.98.44 % Conductivity.		

$$\left(1 + \left[.00032(17°.5\ C. - 16°.9\ C.)\right]\right)\left[1 + (1.08419 - 1.06948)\right] = 1.0149$$

From the above figures it will be seen that the second determination of conductivity does not differ from the first by more than .05 per cent., and in two cases the difference is even less. These three samples are now permanently fixed in the apparatus, forming a series of secondary standards, and can be used as a substitute for the standard ohm in making comparisons with any unknown copper sample, or the unknown copper sample can be compared directly with the standard ohm by simply shifting the little connectors on the switchboard. Should the unknown be compared with the secondary standards, no temperature corrections need be made, and the result will be given in terms of 70° F., no matter what the temperature of the apparatus might be, as this is the temperature for which the standards have been calibrated. The advantage of the above method will be apparent to any one having used an oil bath in connection with any electrical apparatus.

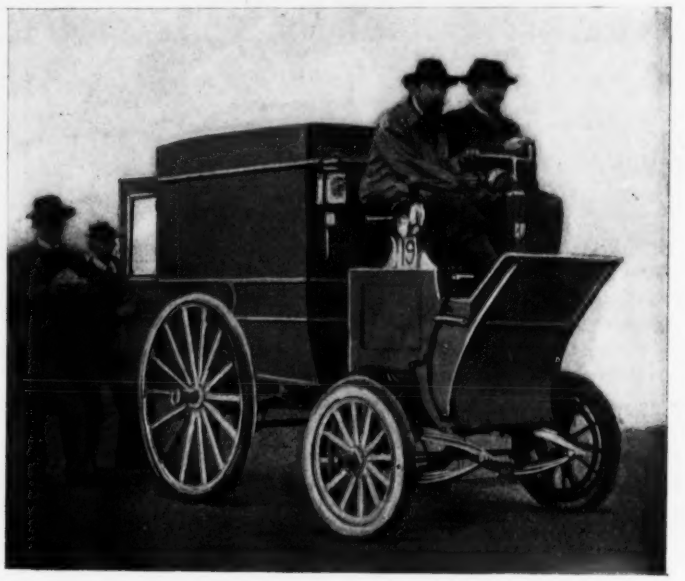
The 50-ft. samples can then be cut into samples of 3 ft. length, for use in the Willyoung conductivity bridge; in fact, this is the way all the Roebling standards are determined, and it also affords the most accurate method of calibrating the Willyoung bridge.

SPECIAL ELECTRICAL WORK for the Dewey Welcome is being prepared already and some of it has been put up. Many of the designs require large quantities of lamps and material, and the supply houses have been kept busy meeting the demands. The heavy work on the large electric letters for Brooklyn Bridge is expected to be done by Monday, when a test is to be made.

French Trials of Electric Delivery Wagons.

In October of last year a trial of automobiles for heavy service was made at Versailles under the auspices of the Automobile Club de France, an extended account of which has just been concluded in the columns of the *Genie Civil*. Of 19 vehicles entered, 8 dropped out for various causes before the end of the trials, and the two electric delivery wagons entered were among the 11 which successfully withstood the test. These, which were numbered 4 and 19, are illustrated in the accompanying cuts. The former was entered by the Compagnie Francaise de Voitures Automobiles, and the latter by M. Krieger.

Vehicle No. 4 (Fig. 1) is 12.1 feet long and 5.4 feet wide, and has a capacity of 1650 pounds useful load, its weight empty being 4620 pounds. The storage battery is installed in a box placed under the wagon and suspended from the frame by means of four helical springs. The battery consists of 42 cells weighing 1540 pounds. The single motor is of the four-pole Lundell type, with double series field windings and double armature windings. It weighs, with its suspension frame and gears, 528 pounds, the rated capacity being 3½-hp. By means of various connections of the field, a rheostat and the do ble armature, three running speeds can be obtained—3.6, 8.4 and 10.2 miles per hour. The cost of the wagon is stated to be $2600. The ratio of traction to entire weight is .63, and of useful to total weight, .266.



FIGS. 1 AND 2.—FRENCH ELECTRIC DELIVERY WAGONS.

Five trips at full load were made over distances of from 25 to 40 miles each, at mean speeds of from 4.7 to 7.5 miles per hour. In the report of the trial committee the wagon is rated as capable of a commercial speed of 6 miles per hour.

The daily fixed expenses were calculated on the basis of 6 per cent. interest on cost of wagon; 15 per cent. for depreciation, care and repair; $40 per month wages of driver, and 15 cents daily for oil and waste. This results in a daily fixed expense of $3.57, to which 10 per cent. is added for general expenses, making a total of $3.92 per day.

The expense for current is based on a cost of 4½ cents per kw-hour. Table I. gives the total daily cost of covering 57 miles with an average of one-third, two-thirds and full load.

TABLE I.—OPERATING EXPENSES, ELECTRIC WAGON NO. 4.

Load.	Kw-hours.	Cost of Power.	Fixed Cost.	Total.	Cost of Useful Ton-mile, Cents.
One-third	33	$1.49	$3.92	$5.41	38
One-half	33.6	1.65	3.92	5.57	19
Full	40	1.80	3.92	5.72	13

Vehicle No. 19 (Fig. 2) is 8.7 feet long and 5.7 feet wide, and has a capacity for 1100 pounds of useful load, its weight empty being 3212 pounds. The ratio of tractive to total weight is .5, and of useful to total weight, .246. The cost is stated to be $3000. The storage battery comprises 40 cells weighing 1005 pounds, and is installed beneath the driver's seat in two boxes. There are two motors of the four-pole type, with two armature windings, and both shunt and series field windings, the shunt windings being on one pair of poles, and the series windings on the other pair. Each motor is rated at 4-hp, and weighs 144 pounds. The speed connections of the wagon are as follows:

For 3 to 3.6 miles per hour, the battery is in two parallel groups, and current passes through all four field coils; for 4.8 to 6 miles, the battery remains the same, and the shunt coils are out of circuit; for 6.6 to 7.2 miles, the cells are all in series, and current passes through all field coils; for 9.6 to 10.4 miles, the cells are in series and the shunt coils are cut out. In all of the above cases the armature windings are in series; for 12 miles per hour, the armature windings are in parallel, the cells in series, and all field coils in circuit; for 25 miles per hour, the same arrangement, but with the shunt coils out of circuit.

Three trips at full load were made over 26.4, 28 and 40 miles, respectively, the speeds being 6.6, 7.2 and 6 miles per hour. The trial committee rated the mean commercial speed of the wagon at 6.1 miles per hour.

Calculated on the same basis as for the other electric wagon, the daily fixed cost was placed at $4.22, and the cost of current was assumed to be 4½ cents per kw-hour as before. Table II. gives the costs for a daily mileage of 57 miles under three conditions as to load.

TABLE II.—OPERATING EXPENSES, ELECTRIC WAGON NO. 19.

Load.	Kw-hours.	Cost of Power.	Fixed Charge.	Total.	Cost of Useful Ton-mile, Cents.
One-third	18	$0.80	$4.22	$5.02	51
Two-thirds	20	.90	4.22	5.12	27
Full	21.6	.97	4.22	5.19	17

TABLE III.—COMPARISON OF ELECTRIC, STEAM AND GASOLINE DELIVERY WAGONS.

Wagon.	Price.	Miles per Day.	Speed.	Useful Load.	Total Weight.	Ratio of Useful to Total Weight.	Ratio of Tractive to Total Weight.
Steam 1	$3800	63	6.6	7260	19448	.37	.6
Steam 2	4800	42	4.2	9240	24772	.37	.48
Gasoline	2000	60	6.5	3300	7414	.44	.74
Electric No. 4	2600	57	6.0	1650	6270	.266	.63
Electric No. 19	3000	57	6.1	1100	4212	.246	.5

Table III. gives comparative figures from the report of the committee on two steam, one gasoline and the two electric delivery wagons here described.

A New Reducing Gear at the Paris Automobile Exhibition.

Among the exhibits at the recent Automobile Exhibition in Paris which attracted much attention, was the Humpage system of reduction gear, a description of which we extract, together with accompanying illustrations, from *La Nature*. Referring to Fig. 1, on the motor shaft at the right, the speed of which it is desired to reduce, there is keyed a conical pinion. At *C* on the shaft of reduced speed, *G*, is a sleeve which turns idle on this shaft and carries two

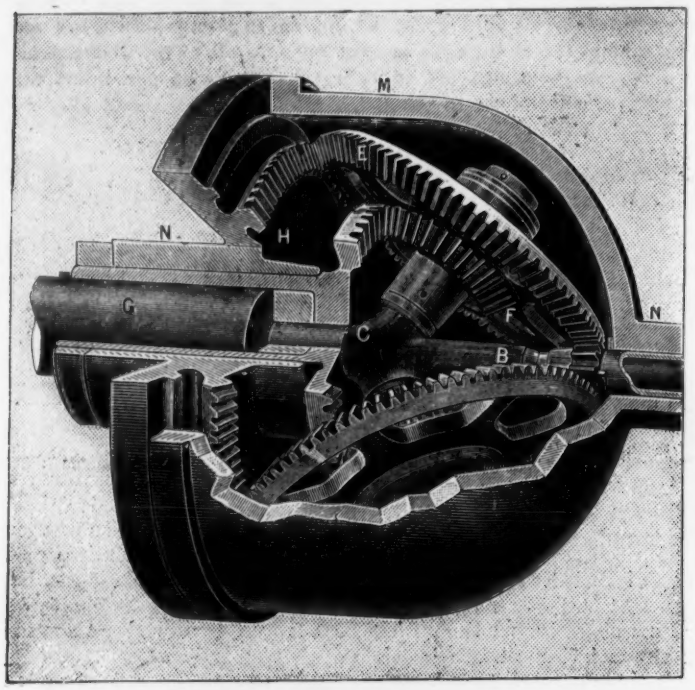


FIG. 1.—APPARATUS FOR SPEED REDUCTION.

arms at 180 degrees from each other. Each of these arms carries two fixed gear wheels, *F* and *E*, which are in one piece, the wheel, *E*, engaging with the motor conical pinion. On the shaft of reduced speed, *G*, is keyed a sleeve carrying a conical gear which engages with the wheel, *F*. On this sleeve is mounted another sleeve which runs idle and carries the wheel, H, and also a plate closing the gear case. The reducing gear thus consists of three conical gears, one mounted on the shaft of high speed, the second mounted idle on the

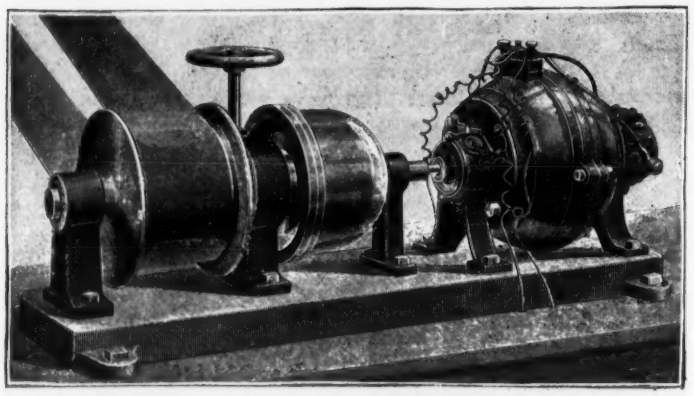


FIG. 2.—APPARATUS FOR SPEED REDUCTION.

two shafts and the third mounted on the shaft of low speed, the union between these three systems being made by means of an epicyclic gear mounted on a sleeve which turn around the axle common to the two shafts.

The operation of the arrangement is as follows: Assume a brake applied on the pulley, *N*, in order to prevent movement of the gear, *H*. The wheel, *B*, carried by the shaft of high speed gives motion in turn by means of the wheels *E* and *F*, to the wheel, *H*, and consequently to the shaft, *G*, of low speed. A formula permits the ratio of reduction to be easily calculated, but it suffices to say that for a total number of 148 teeth there can be obtained by varying within very small limits the number of teeth of the several wheels, reductions of 7.95, 10.65 and 27.55. In some experiments made, three horsepower were transmitted with a reduction of speed of 820 to 100 revolutions per minute, with a mean efficiency of 93.56 in one set of experiments and a mean of 88.94 in another set. Fig. 2 shows the reducing gear as applied to an electric motor running a shaft.

The Trolley in the Sandwich Islands.

BY W. J. JOHNSTON.

"Complicated and volcanic" would seem to about express the present traction situation in Honolulu, Hawaiian Islands. The complications arise principally from the fact that the manager of the old established Hawaiian Tramway Company has not advanced with the times, but persists in continuing to operate his road on the lines of the ancient mule car equipment of ante-electric traction days, while progressive business men of the place, despairing of any substantial improvement under the old administration, have formed the Rapid Transit Company, obtained rights of way much broader than those possessed by the Tramway Company, and sent to the mainland—as they say here in Honolulu—Mr. Frederick J. Amweg, a competent engineer, formerly well-known in Philadelphia, Pa., to place orders for trolleys and power house equipments, wire, rails, cars and all the et ceteras for a first class and strictly modern electric railway. The Westinghouse system is to be used. The power house, plans of which I have seen, promises to be a model of its kind, while the cars will be of the latest and most approved pattern for this section—open, with an aisle in the centre.

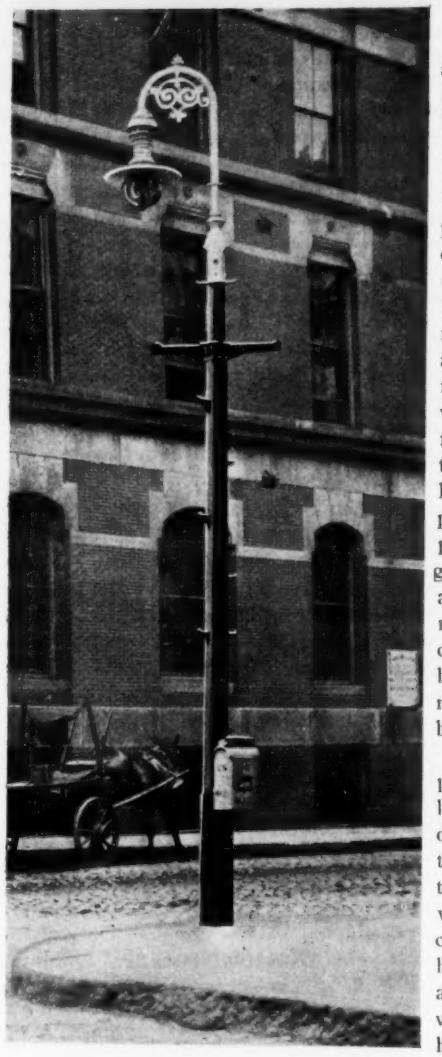
The volcanic eruption is looked for about the time the Rapid Transit Company begins to lay its tracks. The charter of the Tramway Company confines it to horses or cable as a motive power. Subsequently, however, the legislature granted the company the exclusive right to operate electric railways on certain streets in Honolulu. This privilege not being availed of, the legislature afterward decreed that the rights would be considered forfeited unless work under the grant was begun by a certain date—within about eighteen months. That time having elapsed without any effort being made to introduce electric traction, the Rapid Transit Company contends that the Tramway Company cannot now operate any part of its system by electricity and says it will apply for an injunction should any attempt of the kind be made. The Tramway Company, on the other hand, claims that the exclusive privilege granted of operating a street railway by electricity became a vested right, and cannot now be interfered with by the legislature. It says it will invoke the aid of the law just as soon as the Rapid Transit Company shall undertake to do any work in Honolulu. So there you are. The outcome of the matter will probably be the consolidation of the two companies. In fact, efforts to that end have already been made. The Tramway Company, so far as I can gather, is quite unpopular, both with the legislature and with the public, while the Rapid Transit Company, of which Mr. Clinton B. Ballantyne, a Canadian, is the active head, and of which the stockholders are principally American merchants in Honolulu, has the sympathy and active good will of all classes. It is fervently hoped, therefore, by the residents of Honolulu, if I gather their sentiments aright, that in any merging of interests the Tramway Company's management will retire in favor of the more vigorous and more progressive methods of the new company.

Three-wire Wattmeter.

A patent was issued Sept. 12 to Eustace Oxley, of Lynn, Mass, on installing wattmeters on Edison three-wire circuits. With the usual wattmeter, if the fuse employed to protect it against injury is blown or surreptitiously removed and a larger substituted, the consumer can use some of his lamps or translating devices without causing the meter to record. The invention consists in placing in shunt with one or all of the fuses or cutouts, a resistance which should be low in comparison with the total resistance of the meter shunt circuit, but high enough to prevent injurious current from flowing through the meter, even if two of the mains are short-circuited. In the ordinary operation of the meter, while the cutout is in operative condition it will carry the current and protect the apparatus in case of accidental circumstances tending to injure the meter or the system. If, however, the cutout acts, the high-resistance branch permits the meter operating shunt circuit to draw sufficient current to insure its operation. Some of Mr. Oxley's work has been described already in these columns.

Iron Poles, Arc Lamps and Wires in Boston.

BY ALTON D. ADAMS.



NEW ARC LIGHT POLE, BOSTON.

IRON poles and iron towers have been frequently used as arc lamp supports and a steady train of accidents has followed the practice. Items in the daily papers from Boston, Cleveland, Detroit, Fort Wayne and places with similar arc circuits have for years recorded the death of arc lamp trimmer with a regularity that suggests an extra risk in this over most lines of electric work. Had a tithe of the newspaper space devoted to discussion of electric hazards, possible and impossible, been used to point out the greatest single factor in most of these accidents, public opinion might have been so educated to the necessity for better equipment that many lives would have been saved.

The facts are that few positions made necessary by any calling are more dangerous to life than that of an arc lamp trimmer who, often with wet hands and clothing, clings with legs, and perhaps one hand, to a wet arc lamp pole of iron, while with the other hand he grasps a carbon or a rod in direct contact with a circuit of three thousand or more volts pressure. A man in this position on the average arc circuit is as truly in jeopardy as the fireman who scales a burning building, and is even more helplessly in the grasp of attendant conditions, since he cannot by observation determine the extent of his risk.

The great majority of accidents to workers on arc circuits result from what are commonly known as "grounds," that is, ground connections at one or more points on the circuit, the body of the injured person being so located at the time of the accident as to make a second "ground." Owing to the great territory usually covered by the circuits, their exceptional exposure to trees, the corners and roofs of buildings and lamp fixtures and the low grade of workmanship and insulation that has been all too common in their erection and their high pressures, a large per cent. of them are not free from dangerous grounds at some time during the year.

Arc circuits were the first of high pressures to be erected; with no other wires of dangerous voltage are workmen so often in electrical contact, and to no other conductors at equal pressure have the early and insufficient methods of erection and insulation so persistently clung. The natural result of these conditions has been a large number of accidents in connection with arc circuits, not because they are inherently more dangerous than many others, but on account of the greater number of exposures on these circuits and the smaller means afforded for their security. In how many cases have 2000-volt alternating circuits been run on iron poles or around the corners and along the iron front of a building on porcelain knobs? How many experienced linemen or trimmers could be induced to stand on the iron steps of an iron pole and handle with bare hands uninsulated parts of a 2000-volt alternating circuit, when connected to the source of power? Yet these methods of construction and the men who brave them on 3000-volt arc circuits are by no means uncommon.

The electric pressure falls regularly along an arc circuit according to the number of lamps between two points, counting roughly about 50 volts for each open and about 80 volts for each enclosed arc. If, therefore, an arc circuit is grounded at a point having an equal number of lamps between it and the dynamo in either direction, a person grounding one wire of this circuit through his body, may receive a pressure anywhere from zero to one-half the voltage of the dynamo, according to whether his contact with the circuit is close to the previous ground or is between the machine and the first lamp on either side. If the permanent ground on the circuit is between the dynamo and the first lamp on either wire, a person making another ground connection may receive anywhere from zero pressure when contact is made beside the first ground, to the full pressure of the dynamo when contact is made between the dynamo and the first lamp on its other side.

Intermediate positions of the person whose body acts as a ground connection, will obviously result in shocks of intermediate pressure with those above noted. The fact that a grounded arc circuit may be harmless to a person making a ground through his body at one point, give only a slight shock at another point and kill at still a third location, has no doubt had a tendency to increase accidents by giving a false sense of security to workmen. A lamp trimmer, for instance, who feels no twinge while standing on an iron pole and handling the carbons at one point in the circuit may readily conclude that a similar position is safe at other points on the same circuit, though the fact perhaps is that having been close to a ground at the first point, this same action will result in death on the other end of the circuit.

It is necessary for arc lamp trimmers to do more or less trimming and adjusting of lamps while the current is on the circuit, and reasons of public policy and personal safety demand that those engaged in this work have their safety from the dangers of ground connections made as nearly absolute as possible. With whatever care arc circuits are constructed, the question of whether there is a ground on a particular circuit at a given time remains an open one to the trimmer, unless, as is too often the case, the general condition of insulation is so bad that a constant ground has become practically certain. The only security for the trimmer rests therefore in the insulation of his own body from the ground to an extent which precludes enough possible current to do him damage. Where lamps are mounted in fixed positions on poles, the trimmer must usually stand on the pole steps or cross-arm while at work on the lamp, and is therefore dependent on the pole for insulation from the ground to a large degree. An iron pole, instead of being an insulation, usually forms an excellent connection with the ground, much better in fact than a man would make direct.

During a number of years iron poles owned by the city have been used to mount arc lamps for public service in the streets and parks of Boston. Each year of operation regularly increased the number of deaths, which go to prove that it is unsafe to stand on an iron pole and handle a 2000 or 3000-volt arc circuit, so that the Massachusetts Legislature in 1895 took action in the matter by passing a law that all arc lamp poles should be properly insulated. Various combinations of wood and iron in poles for arc lamps were subsequently tested at Boston with view to comply with the law, but a pole entirely of wood was at once found to be entirely satisfactory. Under an extension of contract dated Aug. 29, 1898, it was agreed that the Boston Electric Light Company should replace 2365 iron poles owned by the city and used to support arc lamps with poles entirely of wood, save for an iron top, and this work has been in large measure completed. These wooden poles are properly finished and painted, and are cored to allow wires from the base of the pole to run up inside and then down an iron gooseneck to the lamp. From tests that have been made, it is believed impossible for a person standing on the steps of one of these poles to make enough contact with the ground, through the pole, to receive a dangerous flow of current through the body from an arc lamp circuit. It is thus to be hoped and expected that the electrocution of arc lamp trimmers through the most common conditions is at an end in Boston.

The additional safety to life is not the only advantage of the new poles, another being the smaller leakage from lines in stormy weather. With the iron poles in use it was attempted to operate some of the long arc circuits at a pressure of about 6000 volts, but the leakage in wet weather was so great as to tend to make the automatic regulations cut out the arc dynamos, and the plan was abandoned. Under the contract above named it was also agreed that the open arc lamps in general use by the Boston Electric Light Company for street lighting should be replaced by a form of series

enclosed arc lamps directly under a white porcelain shade suspended from the gooseneck above named. This position of the lamp causes much less shadow beneath it than was the case with the old open arcs, which were directly over the pole and had no shade. The enclosed arcs are to consume 500 watts each on the average and not less than 480 watts in case of any one lamp.

It is claimed that owing to the more nearly horizontal direction of the strongest light rays from the enclosed arc and the smaller shadow, the enclosed arc now used in Boston will give a more extended and satisfactory light than the old open arcs, in spite of the double globes on the enclosed type. The removal of the dangerous iron lamp poles and the introduction of enclosed arc street lamps have not been the only electrical improvements in Boston during the past year. A large amount of overhead material in the form of electric fixtures, poles, wires and cables has been removed from streets and buildings, the figures being as follows:

Poles removed	2,041
Fixtures of all kinds removed	12,891
Wire removed from poles, feet	2,359,050
Wire removed from fixtures, feet	124,176,600
Wire removed in cables, feet	13,845,872
Wire dropping from roofs removed, feet	1,562,186
Railroad guard and span wires removed, feet	340,410
Total feet of wire removed	30,813,838

This total of wire is about 5836 miles, of which about 3502 miles was dead or abandoned wire. The extent to which these figures show dead or unused wire to exist is startling when the serious fire and life-risk which they form through crosses with "live" wires is considered.

Thanks from the writer for above figures are due to Captain William Brophy, chief engineer of the Boston Wire Department, to whose energy and ability the improvements above named are in large measure due.

On the Rational Suppression of Irrational Systems of Units.*

BY PROF. E. HOSPITALIER.

War is declared from different sides upon the C. G. S. practical units, or, more precisely, and in a more general manner, upon all units whose use entails parasitical factors in their relation with other units, even though the said factors are decimals.

It is with sweet satisfaction that we daily see an increasing number of proselytes in favor of simplicity, logic and method in our systems of magnitudes and units, and the time is gone by when we had in opposition to our views—revolutionary at that time—the majority of French scientists, and the entire Institute among the number.

After 20 years of experience, electricians who had had to learn to calculate in the English system, the metric system, the practical C. G. S. system and the pure C. G. S. system—a horrible quartette for the memory—have gradually arrived at the conclusion, that all calculations would be much simplified if the practical C. G. S. system could be suppressed and the pure C. G. S. system substituted by giving definite names to each of the units of this system.

But if agreement is reached as to the principle, which now seems likely, it is by no means yet reached in what concerns the methods of realization.

The two slogans which have sounded hitherto give very different sounds, as our readers have been able to judge in our number of the 25th of July, from an article by M. Blondel, in which appears summarized in a note the proposition of our confrére the *Electrical World and Electrical Engineer,* upon the same subject.

M. Blondel proposes to give to the C. G. S. units, starting with the year 1900, the same names as the practical C. G. S. units, adding to them the prefix *neo,* which would be expected to disappear later on.

This proposition raises such great objections that we hope to see it abandoned by its author himself, after a deeper examination of the question. If the propositions of M. Blondel were to be adopted, in twenty years time the ampere and the neampere, a unit ten times greater than the ampere, would carry the same name, which would lead to distressing confusion—authors not always taking the pains to date their works, their quotations or their selections. We consider that a name once given to a thing should remain invariably and exclusively attached to that thing, and to each new thing a name is necessary, simple or compound, under penalty of establishing error and confusion.

The ampere ought, therefore, to retain its name and value, like the English horse-power, the French horse-power and the other empirical units created during the 19th century, before relative ideas on the subject of units became systematized.

If, as is now evident, the practical units effect a complication, and that it is necessary to substitute for them the C. G. S. units by giving to them special names, one must take the bull by the horns and give to them names *absolutely distinct from those already employed for the other units.* It matters little that these names have for their origin proper names or common names, because after twenty years of use the origin would disappear. We see no inconvenience even in the fact that certain C. G. S. units might have for their origin a common name (centimetre, gramme, second, dyne, erg), and of the other a proper name (gauss, weber, henry, oersted). In christening we ask only that the names already consecrated by use should be retained, and that for the creation of new names, short euphonic expressions should be chosen, and of pronunciation simple in the languages of all civilized countries. This is especially the work of the grammarian or of the polyglot literary man.

When these names shall have been chosen and adopted by an international Congress, it will suffice to draw up a table of the ratios of these C. G. S. units to the other usual units (practical, metric, English, etc.) and to distribute this table as widely as possible. Scientists, professors, engineers and industrial workers will make their calculations, and will give their elements of constructions and operation in the C. G. S. system with the names adopted. Those who will not understand, will make the transformation by means of the table until they reach an understanding. It is thus that the practical system of C. G. S. units will disappear little by little, dying its own sweet death, and the fight will cease for lack of combatants.

Objection will be made to this solution of a sentimental argument, that the names of the pioneers of electricity will disappear with the practical units for which they stand, while the names of scientists perhaps less illustrious will be transmitted to posterity. Our reply to this objection would be that the names of scientists as illustrious as Archimedes, Galileo, Newton, Descartes, Leibnitz, Laplace, etc., are transmitted from age to age without any need of being kept with the unit which popularizes these names. In a thousand years the names of Faraday, Ohm and Volta will not be less known, even if the units bearing their names shall have disappeared. For Ohm, in particular, resistances boxes graduated in ohms will be constructed for a long time to come, or, indeed, existing resistance boxes will be employed which will retard indefinitely the suppression of the *neohms* proposed by M. Blondel to designate the C. G. S. unit of resistance and its replacement by the ohm, because without this distinction the existing microhm and the new milliohm would become identical. It is thus evident how embarrassing would be for students a long transition period from one system to the other in the presence of units of equal magnitudes and appearing under different names.

While retaining the prefixes kilo and mega, milli and micro, there is need for creating new ones to designate simply and conveniently the multiples 10^{9}, 10^{12} and 10^{15}, as also the submultiples 10^{-9}, 10^{-12}, 10^{-15}. None of the propositions made hitherto seem to give complete satisfaction.

In conclusion, the suppression of the practical C. G. S. system and its replacement by the pure and simple C. G. S. system is a rational, logical idea, upon which all scientists, engineers, constructors and practical men should be united on the condition of giving concrete, simple and euphonic names to all the C. G. S. units.

The names already devoted by usage should be retained. The discussion rests open upon the names to give to the C. G. S. units not already provided for up to the Congress of 1900.

*From *L'Industrie Electrique* of Aug. 10, 1899.

To Save the Hooker.

The War Department has decided to save the cable ship Hooker, which is on a reef at Corregidor Island, Manila. The value of the cargo which is to be saved is above $100,000, and consists principally of cable for the use of the Signal Corps in the Philippines, together with other telegraphic and Signal Corps supplies.

On Electric Units.*

BY PROF. E. BLONDEL.

I have read with much pleasure your very interesting article of the 10th of August on the subject of electrical units, because it seems to me that while opposing the form of my propositions for analogous reasons to those set forth recently by M. Blondin in *Eclairge Electrique* of the 5th of August (that is to say, the nomenclature of the C. G. S. units), you accept the principle, namely:

(1) The adoption of names for the C. G. S. electric units.

(2) The ultimate abandonment of the practical system—10^9 centimetre - 10^{-11} gramme-second, and all the annoyances produced by the employment of a volt and an ampere that are too small.

(3) The creation of prefixes for a limited number of powers of 10 (the multiples of three exclusively, and above all, the multiple 10^9).

As the ELECTRICAL WORLD AND ENGINEER has graciously supported my propositions, and as on my side I also attach importance only to the fundamental principle of the question and not to the nomenclature, it should be very easy for us all to come to an understanding, more particularly since the plan of creating new names is the most natural, and that I should be opposed to it only by a personal experience; the Geneva Congress, in fact, rejected in horror the proposed new word "pyr" which I had justified precisely by the arguments which you have now deduced so well, and which at that time had nowhere found an echo.

It would appear to me impossible that one could confound the neovolt with the volt, or the neohm with the ohm, which differ by 10^9. The ampere only has need to be replaced as you justly point out. But would there not be reason to fear that if the extinction of the practical units is not rendered necessary, habit, our second nature, will render the reform as illusory as the substitution of the poncelet for the horse-power?

But whatever may be the value of these objections, and which I make only from recollection of the past, I do not in any way insist upon them, and I join with you readily upon the creation of new names; only logic appears to me to require that what has already been done should be left unchanged in regard to the magnetic units, employing for them the names of known scientists and retaining for the fundamental physical units already denominated, the Greek names which are difficult to replace. I submit to you, for example, the following list of immortals of whom one, Lord Kelvin,† by Providence, is still living, but who has already sufficiently entered into glory that his name may be set upon the Pantheon.

TABLE OF C. G. S. UNITS.

QUANTITIES.	NAMES OF UNITS.							
	Sub-Multiples.				C. G. S. Units.	Multiples.		
	10^{-15} Catho-	10^{-9} Hypo-	10^{-6} Micro-	10^{-3} Milli		10^{3} Kilo-	10^{6} Mega-	10^{9} Hyper-	10^{15} Ano-
Current strength					Galva(ni)				
Voltage					Frank(lin)				
Resistance					Thom(son)				
Quantity					Poisson				
Power					Max(well)				
Inductance					Helm(holtz)				
Capacity					Arag(o)				

They are divided between the different countries in exactly the same proportion as the corresponding practical units replaced. One might readily remember the new units by remarking that *thom*, *poisson*, *max*, *arag* have the sounds analogous to ohm, coulomb, watt and farad, which they replace, and that *galva* is already employed as a radical in the sense of current (galvanometer, galvanic, etc.), and *Franklin* in the sense of high pressures (franklinisation). Fortunately Helmholtz and Henry commence with the same letter.

The name of Hertz may be reserved for the unit of permeability when the idea that a permeability is not an abstract number, but a physical quantity, shall have made its way; but as it seems still strange to eminent authors, it might perhaps be premature to speak of it at the coming Congress.

A creation of prefixes is more difficult if one desires to hold always to the Greek, according to the tradition, before forming them, and this would make it desirable to reduce their number to a minimum. As has been pointed out to me with reason, it suffices to retain for "mega" and "micro" the classical acceptation 10^6 and 10^{-6}, and, consequently, to make the complete triads, there should necessarily be only six words for 10^9, 10^{12} and 10^{15} and their reciprocals. In spite of the charm of symmetry in nomenclature, I do not see any marked utility for the new order of the 10^{12} and 10^{12}, and I should therefore propose to remain contented, provisionally, with "hyper" and "hypo" as the most frequently used multiples and "ano" and "catho" for 10^{15} and 10^{-15}; but if 10^{12} should become interesting later on, there would be time to give it a name. It is the necessity which gives rise to an organ and not an organ which should precede the need.

I must pause, for much might be said upon the subject, and no doubt objections will present themselves before a definite system can be elaborated. It is essential in order that a discussion can come to a genuine, practical conclusion to give it a definite and precise basis, which has hitherto been wanting.

*A communication addressed to Mr. Hospitalier, the Editor of *L'Industrie Electrique*.

† I indicate on my list his patronimic name and not his title of nobility, in the same way that we know the Marshals of the Empire under their names, Davoust, Berthier, etc., and not Prince d'Eckmuhl, Prince de Neufchatel, etc. A Thom appears, besides, more euphonic than a Kel, and recalls mnemonically the ohm which it replaces.

Licensing of Electricians In Minnesota.

The Minnesota State Board of Electricity held a meeting at the Minneapolis City Hall Saturday, Sept. 10, for the purpose of receiving applications for registration certificates and conducting examinations of candidates for licenses. All those engaged in electrical work the six months after the time of passage of the law under which the board was appointed, do not need to take the examinations, providing they register before Oct. 20. One hundred and twenty-five applications have already been received, of which 25 are master electricians, 35 special, and the remainder, journeyman electricians. Several of the articles in the by-laws will interest college men.

That providing for examinations of applicants states that examinations shall be both written and oral, with blackboard demonstrations in any case when such may seem desirable. All but the members of the board and the applicant shall be excluded from the room at the time of examination. Each member shall have the privilege of asking the applicant any question he may see fit pertaining to the general and natural laws of electricity, and of such character as will tend to satisfy the board that he is competent to safely and properly install and repair all classes of electric wires and apparatus in the case of master and journeymen electricians, and in the case of special electricians to safely and properly perform such electrical work as the applicant asks to be registered or licensed for. Regular graduates of four-year courses in recognized colleges of electrical engineering shall be allowed for their college course two years of practical work as a part of the three years of practical work required of journeymen electricians, and one year as a part of the three years of practical work required of master electricians. They may be given special license at any time after graduation upon satisfying the board of their practical proficiency in that particular kind of electrical work for which they wish to be licensed.

An article provides for bonds of master electricians. The bonds are required to be written by a surety company legally authorized to conduct business in the state of Minnesota and legally registered by the Insurance Commissioner of said state.

The law at present applies only to Hennepin and Ramsey Counties, in which are located Minneapolis and St. Paul, respectively. After the next census St. Louis County will also be included, as it has already more than 125,000 inhabitants. The next meeting of the board will be held at St. Paul, Saturday, Sept. 23, at 4 p. m. A short digest of this law was printed in these columns July 20, 1899, page 179.

Destruction of a Niagara Power House by Fire.

The Niagara Falls Park & River Railway and the Canadian Niagara Power Company suffered loss by fire on the night of September 4, as already noted. The station of the Niagara Falls Park & River Railway was located in Victoria Free Park on the Canadian side at the Falls, and in it the Canadian Niagara Power Company had a temporary installation. The station was destroyed by fire and the valuable machinery ruined. The loss is placed at

about $90,000, on which there was $38,000 insurance, $30,000 of this amount being held by the railway company and $8000 by the power company. So far as known the fire originated from a short circuit on the alternating current line. It first appeared in the basement, and the attendant had barely time in which to throw the switches and shut down the wheels before he escaped from the building. In the station the Canadian Niagara Power Company had two 750-kw generators of Westinghouse make, while the railway company had three 200-kw generators of Canadian make. The condition in which the fire left the station is well portrayed in the illustration.

When the fire occurred Hon. W. Caryl Ely, president of the International Traction Company, owners of the Niagara Falls Park & River Railway system, was at the Falls, and as soon as he saw the extent of the fire he at once set men to work to make cable connections with the service of the Niagara Falls Power Company on the American side by way of the upper steel arch bridge. The Canadian road has thus, for the first time, been operated by power generated in the big power station at Niagara Falls on the American side.

The relations between the Niagara Falls Park & River Railway and the Canadian Niagara Power Company are most cordial, and it may be that the destruction of the station at this time may have some effect on the power company's plans. The road can be operated by power from the New York side until the Canadian Niagara Power Company get their proposed new installation at work, when the railway equipment might be placed in that building.

The Canadian Niagara Power Company was supplying current for lighting Niagara Falls, Ont., and vicinity, and fortunately the old steam plant of the lighting company had not been discarded, so it was immediately brought back into service.

CURRENT NEWS AND NOTES.

ELECTRIC TRACTION IN PARIS.—The city of Paris has applied for a concession during the period of 1910-1930 to exploit all the tramway lines of Paris, now operated by private enterprise. It is proposed to apply the sub-trolley electric system to the Bastile-Montparnasse and Montparnasse-Etoile railways.

ELECTRICITY AT HIGH PRESSURES.—The New York Electrical Society has reprinted in pamphlet form Prof Elihu Thomson's lecture on "Electricity at High Pressures," delivered before the society several months ago. Copies may be obtained for 25 cents by addressing the secretary, Beard Building, New York.

THE AMAZON CABLE.—The Amazon Telegraph Company, Limited, has decided, it is said, to abandon the cable in the Amazon River from Para to Manaos. They are, however, building a land line with some links of cable, and have issued bonds for $600,000, at 5 per cent. A subsidy of $85,625 a year for twelve years was granted to the company by the Brazilian government.

ELECTRIC POWER OF THE RHONE.—Though but partly completed, the plant of the Société Lyonaise de Force Motrice du Rhone has now 504 contracts for power amounting to 2465-hp, and 834 contracts for current for lighting, equivalent to 36,266 10-cp lamps. Of the above 1303-hp and 21,810 lamps are now being supplied.

ELECTRICAL INSTRUCTION AT ROCHESTER.—The Mechanics' Institute of Rochester, New York, has instituted an electrical evening course designed for those who have not had the advantage of other than a limited education. There are two classes, one teaching elementary branches, and the other having for its object the preparation of candidates for the State contractors' license.

HAWAIIAN ELECTRIC PUMPING PLANT.—Mr. W. F. C. Hasson, late of Hasson & Hunt, San Francisco, Cal., is engaged in prospecting for underground reservoirs of water on the Island of Lanai, Hawaii. Should water in sufficient quantities be found, it is the intention to build a central electric power plant and distribute the current to various localities for pumping purposes.

TELEPHONY IN HAWAII.—The telephone excange at Honolulu is being changed from the old Law system to the system much used in California and known as the "Express" system. Hawaii is said to have more telephones in use in proportion to population than any other locality in the world. Mr. John Cassidy, the manager, was recently in the United States, among his old friends, making the arrangements for this work.

AUTOMOBILE MECHANISM.—A patent was granted Sept. 12 to William R. C. Corson, on a single motor mechanism for driving an automobile. The electric motor is so arranged that the field frame rotates in one direction and is geared to the driving wheel on one end of an axle, and the armature rotates in the opposite direction and is geared to the driving wheel on the other end of the axle. By this means the desired speed and necessary power may be obtaind with a single motor very light in weight, which will automatically rotate both driving wheels at the rates of speed which they should naturally assume with relation to each other when the vehicle is traveling straight and also when turning around; that is, when the vehicle is traveling straight it will drive the wheels with equal speed, and when the vehicle is being turned, will drive the outer wheel proportionately faster than the inner. A secondary object of the invention is to provide a strong brake that may be applied without subjecting the body or the wheels of the vehicle to any strain. As illustrated in the patents, the armature drives one of the wheels through a pinion and an internal gear, and the field drives the other wheel through a pinion and spur gear. At one end, the extremity of the armature shaft is provided with an exterior cone, and the field shaft is provided with an interior cone, and between the conical surfaces an annular wedge is located. When the wedge is forced in, one side binds against the internal conical surface of the field frame part, and the other side against the exterior conical surface on the armature shaft, thus acting very effectively to check the rotation of the parts without putting any strain upon the wheels or upon the vehicle body.

NEW DANIELL TYPE OF PRIMARY BATTERY.—A patent was granted to Henri de Rufz de Lavison, of Neuilly, France, for a type of Daniell cell in which the depolarization is effected by means of currents of warmed air passed from the bottom of the cell along both surfaces of the copper element. A number of zinc and copper plates are arranged in parallel in each cell. Each of the zinc plates is surrounded by a porous casing of parchment paper and enclosed within a frame of insulating material, such as celluloid, which is kept about one-fifth of an inch away from the copper plates by means of rubber bands. Running under the bottom of each of the copper plates is a tube perforated with a large number of holes. The several tubes of a cell are connected at one end with a single upright tube communicating with a general supply tube at the top of the battery box. Air is forced into this tube by any suitable means as by a blower. When the cell is heated to about 86 degrees F., or preferably to about 140 degrees F., air is blown into the tubes, where it acquires the temperature of the surrounding liquid, and ascending, passes along the surfaces of the upper plates. The electrolyte action contains about 2.5 per cent. in volume of sulphuric acid. A cell having ten zinc plates, each about 6 inches broad and 8 inches high and containing ten quarts of liquid, will give 50 amperes at one volt against an exterior resistance of .02 ohms; or 100 amperes at .9 volt against a resistance of .009 ohm; or 200 amperes at .6 volt against a resistance of .003 ohm, this last condition, it is stated, being maintained for four hours with the same liquid. It is also stated that the quantity of sulphate consumed is about one-third of that which would be expended in an ordinary Daniell cell, and that there is no sensible deposit of copper on the zinc by reason of the solution of copper sulphate. The inventor offers the following theory as to the manner in which the air acts in depolarizing: The water of the electrolyte is decomposed, as ordinarily, into its two elements. The oxygen passes to the zinc and the hydrogen to the copper, heat aiding in producing these reactions. The air blown in acts by its oxygen in two different ways: First, it encounters the liberated hydrogen, part of which combines with a part of the oxygen of the air; second, the uncombined hydrogen encounters the copper sulphate and combines with its oxygen, freeing its sulphuric acid and precipitating copper into the electrolyte. The uncombined oxygen of the air then combines with this precipitated copper and the oxide regenerates the solution of copper sulphate.

TELEPHONE RATES FOR THE PARIS EXPOSITION.—The French Government has fixed a rate of $60 for the installation of a telephone within the exhibition during its term. There will also be cards of admission to public telephone booths within the exhibition grounds which will be sold for $4.

ARMY AUTOMOBILES.—As a result of the recent German army manœuvres, experts assert that the automobiles were found to be easily transportable. Automobiles, henceforth, will be regularly used in army transportation. Some automobiles made during the night and over unknown and unfavorable roads from fifty to seventy miles without breaking down.

A POOH BAH MONOPOLIST.—The town of Rising Sun, Ind., claims to have as a citizen the only person in the United States who is a whole corporation. In 1852 a company was formed under the name of the Rising Sun, Aurora & Lawrenceburg Telegraph Company. The line was built, and in 1872 it was purchased by J. T. Whitlock, of Rising Sun, who has since been day and night operator, lineman, president, board of directors and general manager. It is a clear case of an individual being the whole thing.

FRENCH AND ENGLISH SCIENTISTS.—The president and about three hundred members of the French Association for the Advancement of Science arrived at Dover on Sept. 16 from Boulogne-sur-Mer, on a visit to the British Association. Much has been published recently urging the British Association to ignore the French Association on account of the Dreyfus verdict, but their reception showed that the British Association is not in sympathy with such methods, it being understood that Captain Dreyfus is to be pardoned. While the French Association has been meeting at Boulogne the English has been meeting at Dover, and exchanging wireless messages by the Marconi system. Prof. Fleming received a personal message from Boulogne in three minutes. The time by cable was one hour.

AUTOMOBILE PATROL WAGONS.—Within a short time the Police Department of Hartford, Conn., will be equipped with electric automobile patrol wagons, ambulance and a "black maria." The first vehicle to be fitted will be a patrol wagon, and if the experiment proves satisfactory the others will be similarly equipped as rapidly as possible. Colonel Osborn, of the Police Commission, said that he would have had automobiles in operation before if it had been possible. He believes there are great possibilities in them and will favor their extensive use. Commissioner Meigs Whaples said he was sure the automobiles will give much greater satisfaction than the present plan, and that it will be a great saving to the city. With horses and the present wagons there is a continual outlay. He thought all cities would follow their example before long.

NEW METHOD OF FORMING STORAGE BATTERY PLATES.—A patent was granted to Marcel Wuillot, of Brussels, Belgium, Sept. 12, on a method of forming storage battery plates, consisting in subjecting them to the action of electrolysis in an alkaline bath instead of in an acid bath, as is usual. The lead is subjected to the action of carbon dioxide whereby more or less of its material is converted into carbonate of lead or white lead. The electrodes thus modified at the surface are immersed in an alkaline bath, such as a 5 per cent. ammoniacal solution, in which they undergo electrolysis. After remaining in the bath for a few hours exposed to electrolytic action, a complete reconversion of the carbonate of lead takes place. At the negative plate it is transformed into spongy lead, while the result at the positive pole is a hard and uniformly wrinkled skin of oxide of a closeness and consistency approximate with that of the original plate. The same process may be applied to a plate made of salts of lead produced artificially or mechanically, as in the Faure process.

CITY AUTOMOBILES IN BOSTON.—Mayor Quincy's experiment in the use of automobiles for the chiefs of city departments is proving successful. Only one carriage has been tried as yet, but it has been in use since the beginning of August, and the driver asserts that it does the work of three horses. The carriage is specially intended for Chief Charles Logue, of the repairs division of the Public Buildings Department, and the chief uses it for all the many business trips around town for which he formerly used a horse and wagon. But the automobile does not have to rest, as a horse does, and when the chief is not using the machine it is pressed into service for other business of the department. Mayor Quincy has also ridden in it several times. The employees of the repairs division are inclined to feel well satisfied with a machine that will do forty or fifty miles in the working hours of a day, and this carriage, according to Paymaster T. F. Magrath, covers about that amount of distance on every pay day. Two and sometimes three horses were formerly used on such a trip. There has been practically no trouble so far, except in the matter of tires. Those now on the machine are of the pneumatic pattern, but are too small, and the rough riding over city pavements has shown a tendency to press the tire back against the metal rims in such a way as to cut the rubber.

BROOKLYN INSTITUTE ELECTRICAL COURSES.—The prospectus of the Brooklyn Institute of Arts and Sciences outlines five courses in electricity for the institute year beginning Sept. 28. Course I. consists of five illustrated lectures on current topics of interest in electricity, to be delivered the first Friday evening of each month, commencing Jan. 5. Among the lecturers are Messrs. W. T. Barstow, Frank J. Sprague, F. V. Henshaw and Prof. J. S. McKay, the subjects being: "Some Recent Problems in Electric Lighting," "Regulation of Electric Apparatus on Electric Railways," "Electric Power Transmission" and "Wireless Telegraphy," respectively. A lecture on "Automobiles" is unassigned. Course II. consists of six lectures by Prof. Samuel Sheldon, to be delivered on the evenings of Oct. 2, 9, 16, 23, 30 and Nov. 6, the subjects being electric batteries, electrical measurements, chemical relations of the current, magnetism, electromagnetism and electromagnetic induction. Course III. comprises six lectures by Prof. J. S. McKay on Monday evenings from Nov. 13 to Dec. 18, on thermal relations of the current, the earth's magnetic field, static electricity, electric condensation and discharge, high potential and high frequency current, and electric waves. The lectures in Course IV. have not yet been assigned, and Course V. will consist of visits of instruction to electrical stations.

PORTABLE TESTING SET FOR HIGH INSULATION RESISTANCES.—At the meeting of the Engineers' Club, of Philadelphia, last Saturday, Wm. C. L. Eglin described and showed a very interesting piece of apparatus which he designed and which was built by the Philadelphia Edison Company for use in its station, of which Mr. Eglin is chief electrical engineer. The apparatus is a very convenient portable substitute for the usual mirror galvanometer or other electrical apparatus which has heretofore been used for measuring very high resistances, and is intended to be taken out on to the streets to the manholes or to the machines which are to be tested for insulation. It is furthermore arranged in a very convenient way so that, after a very little instruction, it can be used by any one who is used to handling Weston instruments. The whole apparatus is in the form of a box which can be carried around on a wheelbarrow. The underlying principle is that a very high voltage is used in order to enable the galvanometer to be a portable one of the Weston type, and one which reads directly by deflection of a pointer on the scale. The galvanometer is of the d'Arsonval type, and is like the Weston instruments, except that it is more sensitive. The high voltage of the direct current is obtained from a small ¼-hp motor-generator, the low potential side of which is supplied from a six-volt accumulator battery in the same box with the apparatus. This voltage is raised to 1000, which is continuously discharged through a resistance of 100,000 ohms; the current used for testing is then shunted off from any desired part of this resistance, thus enabling any particular voltage to be used up to 1000. The galvanometer can also be shunted. All the various switches in connection with the apparatus are conveniently arranged on the top of the apparatus. Convenient arrangements are also provided for obtaining the constant of the instrument very quickly, although it is stated that the constant will vary but little, and for most purposes may be assumed to be constant. With the most sensitive adjustment the apparatus enables one to measure as high as 1000 megohms with a deflection on one division of the scale, which is about one-sixteenth of an inch. The design appears to be an eminently practical one, and the apparatus will no doubt be of considerable service to central station engineers.

THE DREYFUS CASE.—The undeniable ability of the French telegraph department, not less than the French passion for justice and honesty, has been strikingly exemplified in the recent melodrama at Rennes. Despatches from France state that the telegraph depart-

ment has netted from the opening of the trial to the end of August the sum of 800,000 francs ($40,000). One Austrian journalist alone sent despatches to the tune of 6500 francs a day. For the entire trial the receipts were $90,000, and between eight and nine million words were sent out.

EVENING ELECTRICAL SCHOOL.—The Harlem branch of the Young Men's Christian Association will conduct an evening electrical school at 5 West 125th Street from October, 1899, to April, 1900, with Mr. Wm. J. Clarke as instructor. The sessions will be held on Tuesday and Friday evenings, and the course will cover the various branches of telegraphy, telephony, police and fire alarm telegraph, arc lighting, alternating current apparatus, the distribution of electric power, the electric street railway, the electric automobile, the Rontgen rays and wireless telegraphy. The membership fee is $5.00.

SPECIAL LIGHTING EFFECTS IN DETROIT.—The special lighting of the Elks' Carnival, which was held in Detroit, Mich., from August 21 to September 2, inclusive, has been universally commented upon as one of the prettiest and most effective pieces of decorative lighting ever seen. The particular feature of this lighting, differing from previous decorative illuminative lighting, was the use of colored lamps—no clear lamps being used for any of the decorative work. The colors used included amber, green, red and purple (the latter having been made especially for this installation), the Elks' colors are purple and white, but white lamps were not used, as the white groundwork of the arches, etc., were sufficient in combination with the purple lamps to produce the color effect desired. In selecting the colors for the different arches a careful study was made of the decorations, lamps being used at each point of such color as would best blend with and bring out the full color effect of the permanent decorations, with the added general plan of using amber-colored lamps (which were the most brilliant of any used) for the entrances, and working upwards from these into the darker and richer colors; so that while the general effect was a handsome combination of Oriental colors, yet the brilliant centre of each was the entrance, the rest forming the frame of the picture. Something over 2000 incandescent lamps were used to produce these effects, and about 50 constant potential enclosed arcs for the lighting of the grounds. The work was done by the Michigan Electric Company, under the direction of President J. E. Lockwood.

AUTOMOBILE CONTROL.—In a patent issued Sept. 12 to Henry Leitner, London, England, a method of control for automobiles is described which involves the use of two batteries—a large battery for furnishing the armature current and a small battery for exciting the field. The exciter battery, which may consist of two cells, do not require to have a great capacity, but must be of a kind which will allow a large current to pass through them and will be able to stand great variations in the current. The form of cell used by the inventor is stated to have the additional advantage of polarizing with very high charging currents, thus automatically choking off excessive currents from the armature; its own voltage often is over 3 volts per cell, under the circumstances referred to. The battery is normally connected in the main circuit in opposition to the main battery, so that it is kept charged by the current from the latter passing through the armature. On the motor increasing in speed beyond the limit set by the controller, owing to the vehicle running down hill or from any other cause, the separate exciting battery enables the motor to act as a brake and also to send a charging current back to the main battery. The current from the main battery has a double path on its way to the motor, one path leading through the exciter and the other through the field magnets, the exciter and the field magnet being thus in parallel with respect to the main circuit. A controller is described in detail which permits of the following connections being made: 1. The two parts of the main battery are in parallel and a current at an e. m. f. of, say, 40 volts is supplied to the armature of the motor, the field magnet being fully separately excited. 2. The two parts of the battery are placed in series and current at, say, 80 volts is supplied to the armature, doubling the speed of the motor, the field magnet remaining fully separately excited. 3. The grouping of 2 is not altered, but the strength of the field is reduced, giving greater speed to the motor. 4. A further resistance is brought into the field and exciter circuit, again increasing the speed. The variations of speed obtained by weakening the field can, of course, also be introduced between speeds 1 and 2. The exciting battery may also be thrown in series to aid the main battery.

AMERICAN MUNICIPALITIES CONVENTION.—The meeting of the League of American Municipalities opened at Syracuse, N. Y., on Sept. 19, with some 600 delegates present and three or four hundred more expected. Great interest was shown in the proceedings. Mayor McGuire welcomed the members, and said: "There is undoubtedly a general feeling in the United States that the methods and results of city government are inferior to our national government system. And yet there has been a vast improvement in the government of our municipalities during the last decade. The time is not far distant when our city governments will cease to be a reproach to citizens. The American people in time will solve these municipal questions because they are studying and endeavoring to solve these vexing problems; and when our people begin to think about them there is a hope and often a surety that they will succeed. If our municipal management is often unworthy we must remember that most of our municipalities are new, and that when forms of government are new the people are indifferent or inexperienced and there creeps into new governments various abuses which only time, intelligent understanding and knowledge of effective remedies will eradicate. Nearly a century has been needed to build up our great Republic with its many existing defects. How can we expect to have perfect cities when the real problems of municipal life have only confronted us within the last twenty years? In thirty years we have become a nation of cities."

LETTERS TO THE EDITORS.

Death from Electricity

To the Editors of Electrical World and Engineer:

Sirs:—In your journal of Sept. 16, I notice that your editorial comments based upon the imperfect, exaggerated and sensational accounts of certain scientific experiments performed by me last winter, credit me with holding certain opinions in regard to the death of men by electricity that I do not entertain. Therefore, kindly allow me to say that before wielding the pen in refutation of any statements alleged to have been made by me, it would be well to read carefully all the details of the various experiments described in my paper, a reprint of which will be sent you as soon as it is received by me from the *New York Medical Journal.*

Let me remark also that nowhere in that paper do I criticise, except favorably, the method pursued at the official electrocutions. Moreover, as regards the probable painlessness of the death produced by contact with a powerful electric current, I certainly bring forward in that paper ample clinical evidence to substantiate the probability of the existence of that condition. I discuss in that paper also the question of the absolute instantaneousness of death from industrial currents, but, possibly, we have different ideas of what constitutes absolutely instantaneous death.

To my mind, for an individual to be killed instantaneously by a current, his death, that is, the complete and permanent annihilation of all the physiological functions of the body, or to speak less broadly, the complete and permanent annihilation of the functions of the circulatory and nervous systems, must occur synchronously with the beginning of the flow of the current. To positively assert that such a thing occurs where a man is traversed by a current of 8 or oven of 20 amperes is absolutely unsubstantiated by any definite material scientific evidence, while every bit of the evidence obtained from reliable and properly conducted experiments on the lower animals shows quite conclusively that though the animals die with very great rapidity, nevertheless their death is not synchronous with the application of the current. That such an occurrence could be produced, I have not the least doubt, but an extremely large number of amperes at a high tension would be necessary. Thus, by suddenly discharging very large condensers charged to a considerable potential through isolated living muscles, large nerve trunks, and through certain parts of the nervous system after exposure, I have produced what appeared to be instantaneous death of those parts.

Such effects, however, could be explained definitely only as being due probably to the heat which instantly coagulated the entire tissue That such a general heat coagulation of the tissues of the nervous system, of the heart, etc., that are traversed by some of the streams of current usually employed in the official electrocutions does not

occur, I am positive, for I have examined microscopically specimen tissues taken from those portions of such bodies, but in no specimen was there evidence of any such condition.

In conclusion, allow me to say that were you or I to attend a thousand official electrocutions performed in the well known way, and no doubt thoroughly so, neither could possibly learn more than the fact that a man meets his death very quickly after a powerful current has been applied to him for one or more minutes. But assuredly a demonstration of that character cannot possibly convey to either of us any definite, detailed, scientific information as to exactly how that man died, or just when he died, whether he felt anything or not, or whether it is possible to resuscitate him by the immediate application of some special method. Naturally, such questions cannot be answered definitely until some trained observer is allowed to attach the proper physiological apparatus to such an individual in order to graphically register and record the source of the various phenomena that take place during and after the passage of the current. But should you care for a visual demonstration of the experimental facts described in my paper, I shall be most happy to demonstrate their truth, should you consent to be present at certain resuscitation experiments that will shortly be performed by me.

NEW YORK. R. H. CUNNINGHAM.

Unipolar Motors.

To the Editors of Electrical World and Engineer:

Sirs:—If Mr. James Asher will take the trouble to draught out his unipolar motor, as described in your issue of Sept. 9, I think he will come to the conclusion I came to some years ago when I made a similar attempt—that it is impossible to avoid the moving contact. I had the same idea of revolving field with stationary field coil and armature. I made a memorandum of it, and later during a leisure spell, sat down to design a working machine and, curiously enough, it was for an automobile. All went well until I looked for a place for my connecting wires. I found one had to be inside the magnet, and to bring it out it would be cut by the same lines of force as the cylinder, which would neutralize the voltage. I came to the conclusion that it would be a good mate to the problem of multiple winding of the same machines.

Later, I tried to design a machine with a ball bearing for collector, but I could not reconcile the high amperage with the small contact surface of balls, or even rolls, and so abandoned that before going beyond the paper stage.

BROOKLYN, N. Y. HARRY E. DEY.

DIGEST
OF
CURRENT ELECTRICAL LITERATURE.
By CARL HERING.

DYNAMOS, MOTORS AND TRANSFORMERS.

Inductor Alternators.—EBORALL.—A communication criticising the article of Scott on alternator design (Digest, Sept. 16) and pointing out that there is no difficulty in designing normally proportioned inductor machines to run without undue heating, and that it is only the impossibility of building them at a sufficiently low cost, with a proper fall of pressure in the armature upon inductive loads, that is causing this type to be abandoned. With a given maximum flux through each armature coil, the total number of turns required to produce a given e. m. f. is twice that which is required in an alternator having an alternating instead of an intermittent flux, which disadvantage is, however, partly compensated for by the fact that very high flux densities can be used in the armature without prohibitive core losses, the flux being largely confined to the teeth. But as all the idle armature turns carry the current generated by the active set, their self-induction greatly effects the pressure regulation, while at the same time their ohmic resistance increases the copper loss. Furthermore, unless the air gap is quite small, there will be considerable leakage flux from all portions of the armature surface to the inductor poles, nearly all the flux not coming from the surface directly opposite the poles, will pass through the armature coils which should be idle, and will generate back e. m. fs. in them, greatly affecting the pressure regulation. As a small air gap is essential and the flux densities are very high in the armature, large changes of excitation have to be made to produce even small alternations in the terminal pressure. The machine becomes very inflexible and its field of application exceedingly narrow, unless built very large and heavy and designed most carefully. He concludes that good machines above 60-kw output of the inductor type, cannot be built at a commercial figure, unless the speed is abnormally high, such as with very high speed turbines. He wonders that steam turbine makers have not adopted or pushed inductor alternators, as for such purposes the mechanical advantages would enter, and the electrical conditions be quite favorable.—Lond. *Elec.*, Sept. 1.

Wehnelt Interrupter for Starting Single-phase Induction Motors.—GRASSI and LORI.—A short illustrated article describing an interesting method of using the Wehnelt interrupter for starting single-phase induction motors, based on the following principle: If two equal induction coils 1 and 2 are connected in series and a Wehnelt interrupter is shunted around one of them, say number 2, then when an alternating current of at least 30 to 40 volts is sent through the coils, the ratio of the currents in the two coils will vary, as the resistance of the interrupter varies from practically nothing to very high values. When the resistance of the interrupter is very high, the current in both coils is the same, but when the resistance diminishes, the current in coil 2 decreases, and that in coil 1 increases, which will change the magnetic effects of the currents. Now if the two coils are so arranged that their magnetic axes are at right angles, then the resultant magnetic field due to both is constantly varying in direction with a periodic fluctuation equal to the period of the interruption. (It seems that if the resistance of the interrupter changes from zero to infinity, the ratio of the currents in coils 2 and 1 changes from zero to one and the radius vector rotates through an eighth of a complete revolution.) If the two coils are the two field windings of a single-phase induction motor, the motor will be acted upon by this rotating field and will experience a torque, even if at rest. Experiments were made with a 20-hp Brown-Boveri motor, the interrupter containing a saturated solution of carbonate of soda, with one electrode of a large lead plate and the other of a bundle of 0.3 to 0.4 inch electric light carbons, so that by regulating their number and depth of immersion, the frequency would be varied at will. The motor is said to have started with a large torque, under heavy load, and consuming no more current than when started by the ordinary method of choking coils and resistances.—*L'Elettricista*, Aug. 1; translated in abstract in *Elec. Rev.*, Sept. 6.

High Resistance Materials for Starting and Regulating Motors.—Two communications discussing the advantages and disadvantages of high resistance materials for use in starting and regulating motors and similar purposes. In the first the question is treated analytically for round wires. The total cost of a resistance of given ohms and of given current-carrying capacity, varies with different materials, directly as the price per pound, the specific gravity and the cube root of the specific resistance. For a constant power consumption the length of material is less in high-resistance materials than in low, but the cross-section and total volume of material used are greater. In some cases this increase in section may more than counterbalance the advantage gained by the diminution in length, as, for instance, in the case of coils wound on a mandril, in which the large diameter may necessitate the use of a larger mandril, thereby preventing the coils from being placed so close together; but under most circumstances a high resistance material will make up into a more compact form than one of low resistance. Another distinct advantage in many of the high resistance materials is their small temperature coefficient, which is often important. In cases, however, like the starting of motors, the resistance is not often in circuit long enough to allow the variation to become excessive. In the case of shunt regulating resistances, the temperature coefficient should invariably be small, hence high resistance materials are generally used for this purpose. Useful figures are given for various materials in a table, among which are the following: The relative lengths for constant power consumption are, for copper 1, aluminium 0.823, iron 0.481,

platinoid 0.345, manganin 0.342, eureka 0.321, resista 0.279, krupp or wolffin or beacon 0.270. The relative weights, for copper 1, aluminium 0.362, iron 1.821, platinoid 2.905, manganin 2.924, eureka 3.107, resista 3.282, krupp 3.364, wolffin 3.388, beacon 3.373. The relative price, for copper 4.4, aluminium 6.8, iron 1, platinoid 62.6, manganin 70.6, eureka 47.8, krupp 59.1, wolffin 37.2, beacon 46.3. Iron wire, plain or galvanized, which is seen to be by far the cheapest, is said to give excellent results, if used for starting and regulating resistances in all ordinary cases, and the only objection to it is its very high temperature coefficient.—Lond. *Elec. Eng.*, Sept. 1.

Lights and Lighting.

Double Arc Lamp.—An illustrated description of a type of lamp in which there are two arcs burning at the same time between two pairs of carbons connected in series, both operated by a single regulating device, but notwithstanding this, the two arcs are independent in so far that they need not both burn exactly alike. The two upper carbons are adjusted by a single regulating device; the two lower carbons are mechanically connected through a lever or similar device so that as either moves up the other moves down, which allows for equalization in case the two are not alike.—*Zeit. f. Beleucht.*, July 30.

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Open Arc Lamp Carbons.—Richardson.—A short article giving the results of comparative tests of three kinds of open arc lamp carbons. He determined the ash, resistance and percentage burned in ten hours.—*Pract. Eng.*, July.

Incandescent Lamps.—Illustrated descriptions of some new lamp bases of Siemens & Halske, some decorative lamps of Orlow and the lamp of Farrall with a double spiral filament.—*Zeit. f. Beleucht.*, July 20 and Aug. 20.

Power.

Meran and Bozen.—Miller.—A long, well illustrated description of the plant supplying electricity to Meran and Bozen from a common power station where the water power of the River Etsch is used, the total output of which is about 6000-hp. There are six three-phase current generators, one generating current at 3600 volts, for transmission over three miles to Meran, a second current at 10,000 volts for transmission over 24 miles to Bozen, a third and fourth each having two separate armature windings so that they are able to furnish current at 3600 or 10,000 volts as reserve machines. A fifth and sixth dynamo generate current for a calcium carbide plant. In Meran the current is distributed in underground feeders at 3000 volts. The current transmitted to Bozen is transformed in a suburban substation down to 3000 volts and then distributed through Bozen in underground feeders. The transformation from 3000 to 110 volts is made in both cities either in special substations or in transformer rooms in buildings. When the installation was started in April, 1898, 85 arc and 770 incandescent lamps for public lighting and 24,000 incandescent lamps for private lighting were connected. Subsequently 2000-hp were rented to the calcium carbide plant. The plant and installation are municipal, both cities being the owners.—*Elek. Zeit.*, Aug. 31.

Long Distance Transmission.—Van Norden.—A short Pacific Coast Electric Transmission Assn. paper, giving some experiences obtained on the long distance transmission line from Auburn to Sacramento. In stringing the wire the supply of large triple-petticoat glass insulators gave out and some standard two-petticoat glass insulators with teats were used temporarily to support a mile of wire; locust pins boiled in paraffine until thoroughly soaked were used, and proved to be very successful. No difficulty was experienced in synchronizing the generator at Auburn with that at the other generating station at Newcastle, five and a half miles distant; the line is of No. 4 copper wire; it was feared that as the capacity was small, there would be a current lag or change of form of curve, causing the machines to pump.—*Jour. of Elec.*, July.

100-Mile Transmission Plant in Egypt.—A short note on a plan under consideration for the lighting of the pyramids by electricity and the installation of an electric power transmission plant of 25,000-hp. A generating plant is planned at the Assouan Falls on the Nile, from where the power has to be transmitted over a distance of 100 miles, through the cotton-growing districts, where, it is thought, the provision of cheap power from this source will permit the building of cotton factories.—*Can. Elec. News*, Aug.

Orillia Transmission Line.—A note stating that this is the first municipal long distance electrical power transmission in America; aluminium was intended to be used for conductors, but it is now decided that copper wires will be used.—*Can. Elec. News*, Aug.

Efficiency.—Walker.—A short communication defining the theoretical and commercial efficiencies and claiming that the efficiency of transformation is often increased at the expense of the commercial efficiency; the latter he defines as the ratio of the cost of the article supplied, to the price obtainable for it. Sometimes the interest on the capital involved in increasing the theoretical efficiency is greater than the saving of the coal, etc. There is nothing so commercially efficient as continuous running, and if therefore 100 sewing machines are to be driven electrically he prefers to use 100 separate motors in order to prevent complete stoppage.—Lond. *Elec. Rev.*, Sept. 1.

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Distribution of Energy.—Guilbert.—A long, well illustrated article giving a good description of some of the more recent systems of electrical distribution of energy, such as Steinmetz's system of alternating current distribution for lighting and power purposes by means of three alternators connected in series, or of one alternator and two non-synchronous motors connected in series, etc.; Lamme's system of alternating current distribution with the use of two transformers and one converter for feeding a three-wire system; also the systems of Wade, Moores and Farell for direct current distribution. All these systems are clearly described with the aid of diagrams.—*L'Eclairage Elec.*, June 17.

Water Power Electric Plants in the United States.—Washington.—A Franklin Institute paper giving descriptions (without illustrations) of the Folsom-Sacramento and the Newcastle-Sacramento transmission plants, of the electro-metallurgical plant at Mercur, Utah, and of the Mechanicsville-Schenectady power plant (all of which have already been described in the Elec. World) and discussing the methods used for coupling water wheels and generators, and the miscellaneous applications of electricity for power purposes. *Jour. Frank. Inst.*, September.

Canadian Water Power.—Keefer.—A reprint in abstract of an address read before the Royal Society of Canada, on Canadian water power and its electrical product in relation to the undeveloped resources of the Dominion. The utilization for electrochemical, mining and traction purposes is discussed.—*Can. Elec. News*, August.

Electrically-Driven Centrifugal Pumps.—Hicks.—A long illustrated paper read before the Pacific Coast Electric Transmission Association giving the results of tests of centrifugal pumps, coupled to 30-hp induction motors, driven by three-phase current. The characteristic curves are given in diagrams.—*Jour. of Elec.*, July.

Electrically-Driven Machine Tools.—A short illustrated description of a twenty-five-foot plate planing machine, driven by a direct-coupled electric motor, with an automatic controller.—Also an illustrated description of a thirty-inch motor-driven drilling machine.—*Amer. Mach.*, Aug. 10.

Application of Motors.—An illustrated description of the application of electric motors in a porous plaster factory.—*West. Elec.*, Sept. 9.

Traction.

Overhead Contact Bar.—An editorial stating that on the European Continent the overhead contact bar is more generally used in place of the trolley wheel, which latter is said to be considered to be symbolical of crudity in practice. The upper bar or bow is made of aluminium having a longitudinal groove filled with fat which is intended to overcome the scraping noise; the life of a brass bow covered with white metal is said to be about two weeks, while an aluminium one lasts from six to eight weeks; the maintenance cost of both is about the same, namely, 0.026 cents per car mile. The contact pressure should be just sufficient to prevent sparking, and according to a law in Dresden it must not exceed 7.7 pounds. It is claimed to be erroneous that the bow contact wears the trolley wire more rapidly than the roller; the former wears only on the bottom of the wire, while the roller wears it off on the sides also.—*Cassier's Mag.*, September.

Sheffield Tramways.—A long, well illustrated description of the municipal tramways in Sheffield, England, the first section of which has just been opened. The overhead trolley wire system is used, the current at 500 volts being generated in the plant situated in the midst of the network by three dynamos of 225-kw. The installation is in general agreement with English tramway practice, the chief

points of different being the use of marine boilers with forced draught, the addition of two extra brakes on the cars and the use of a serrated rail. The rails, weighing 108½ lbs. per yard, are of the usual girder section, but the "lip is serrated;" the serrations have a depth of three-sixteenths inch and there are about 20 to the foot.—Lond. *Elec.*, Sept. 1.

Automobiles.—MAXIM.—An article, with many illustrations of American, French and English automobiles, discussing the relative advantages of electricity, gasoline and steam power for automobiles. The electrical system is claimed to be the best on account of the simplicity of operation and its availability for private carriages and delivery wagons, provided the distances are not more than 30 miles over ordinary grades at an average speed of 11 miles an hour, which represents one discharge of the battery, and provided the load to be carried by delivery wagons is under 1000 lbs. The other motive powers are better able to fulfil the requirements of greater distances and heavier loads.—*Cassier's Mag.*, September.

Automobile of the Fire Department in Paris.—A short illustrated description of this automobile which has been on trial for four months with good success. The battery has a weight of 520-kg, which is only a fifth of the total, 2500-kg, including the crew, and a capacity of 150 ampere hours at the rate of 35 amperes. If discharged in 17 hours 48 minutes, or in 7 hours 24 minutes, or in 3 hours 52 minutes, the accumulators give 26.7, or 22.2, or 19.35 ampere hours per kg of plates respectively, at 1.5, or 3, or 5 amperes respectively, per kg of plates. It will run 4 to 5 hours at speeds of 15 to 22-km per hour.—*L'Ind. Elec.*, Aug. 10.

Electric Canal Haulage.—Two short notes stating that the Thwaite-Cawley system of electric canal haulage is to be tried by the Leeds and Liverpool Canal Co. on a mile of the waterway at Wigan, England. Both increased speed and decreased cost are expected.—Lond. *Elec. Eng.*, Aug. 25, Sept. 1.

REFERENCES.

Florence.—An illustrated description of the electric tramways of Florence, Italy. The current at 550 volts is generated by three dynamos of, together, 1075-kw. The overhead wire system is used and it is said that the wires do not seriously mar the appearance of the fine squares or streets. There is a comparative absence of guard wires, as the telephone lines have, wherever possible, been put under ground.—*R'y World*, reprinted in *Elec. Rev.*, Sept. 6.

Blackpool.—An illustrated description of this tramway, in which the conduit system has just been replaced by the trolley, as referred to in the Digest, Aug. 19.—Lond. *Elec. Rev.*, Sept. 1.

Hamburg.—A reprint of a consular report giving some notes on these tramways, on which the Thomson-Houston system is used.—*Elec. Rev.*, Sept. 6; *West. Elec.*, Sept. 9.

Potteries Electric Railway.—An illustrated description of this line referred to in the Digest, June 10.—*The Engineer*, Aug. 15.

Surface Contact Systems.—CLAUDE.—An illustrated description of various systems.—*L'Ind. Elec.*, Aug. 10.

Accessories in Electric Traction.—COTTRELL.—In the continuation of his long illustrated serial (Digest, Aug. 26) he discusses lighting couplings, commutator segments and brushes, circuit breakers and lightning arresters, trolleys, trolley pole catchers, reels, couplings and bonding.—Lond. *Elec. Rev.*, Aug. 18, 25, Sept. 1.

Electric Traction.—GREATOREX.—In this continuation of his long serial (Digest, Sept. 9) he gives short descriptions of 22 lines, mostly in Great Britain.—Lond. *Elec. Eng.*, Sept. 1.

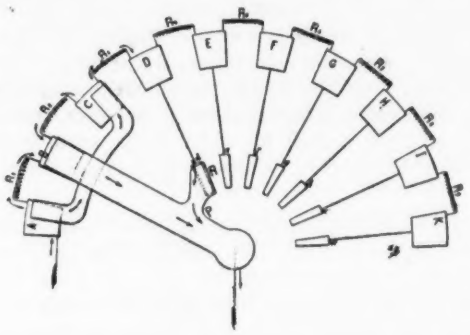
Return Feeders of Electric Railways.—BOHM-RAFFAY.—A long translation in abstract, of the article noticed in the Digest, March 25.—*L'Eclairage Elec.*, July 1.

Automobile Exhibition at Dover.—A short article describing the general arrangements of the automobile exhibition which will be held in Dover, England, from Sept. 19 to 21.—Lond. *Elec.*, Sept. 1.

INSTALLATIONS, SYSTEMS AND APPLIANCES.

Zurich and Lucerne.—In this continuation of the long series on electrical engineering in Switzerland, short descriptions are given of the works of Escher, Wyss & Co. in Zurich, one of the largest mechanical engineering works in Switzerland, and one of the first to be driven with three-phase current; also of the Zurich Polytechnic and of the telephone system of Zurich. The power transmission and distribution from Rathausen, three miles from Lucerne, is described. The water power of the River Reuss is utilized, two-phase alternators generating current at 3200 volts. The two-phase system is used with three conductors, the common return being of considerably larger size in every case. The total length of the overhead pole line is nearly 20 miles. The aggregate of the 62 motors connected is 1598-hp. The 3000-volt current transmitted from Rathausen is transformed in transformer substations placed in iron towers or in the buildings, to 250 volts for power and 125 volts for light. In Lucerne itself the pressure of 3000 volts is not admitted, so a 200-kw transformer station is placed at Eichhof to reduce the pressure to 1500 volts for underground distribution. In Lucerne, power will be supplied to the new tramways and for lighting. In the power house, a distance of 2½ miles from Lucerne, the water power of the River Emme is utilized; single-phase current is generated at 2300 volt, and is distributed from substations. There are 32 transformer stations, each with its own secondary network. The total lamp connection is equivalent to 18,000 lamps of 40 watts. Larger motors than 7-hp are supplied by the Rathausen plant. Power for the tramways is brought from the Rathausen works and will be transformed to 550 volts continuous current by two motor generators, after being transformed from 3000 to 2000 volts, which is the pressure of the municipal supply, so that the latter can be used as a reserve if required, and that when all the energy for the tramways is not needed, part of it can be used on the town lighting network. Some tramways in the neighborhood of Lucerne are also briefly described.—Lond. *Elec.*, Sept. 1.

Improvement in Regulating Resistances.—GRATACAP.—A proposition of the following addition to the device of Vedovelli described in the Digest, May 13, enabling a step-by-step resistance to be varied within still smaller limits. Vedovelli's device allows $2n-1$ steps with n contact blocks, to be obtained, while with the device of Gratacap there may be $3n-3$ steps, which is accomplished by adding a concentric row of contact blocks corresponding to the fourth, fifth, . . . nth main contact block, each of these auxiliary contact blocks being connected with the respective main contact block, as shown in the adjoining figure. The lever arm or crank has a small



lateral prolongation to make contact with these auxiliary blocks. If the lever arm rests on the second main contact block, the ends of Vedovelli's U-shaped piece on the first and third main blocks, and the lateral prolongation on the first auxiliary block, corresponding to the fourth main block, then the three resistances between the first four main blocks will be in multiple. If the crank is moved a little so that the lateral prolongation is no longer connected with the first auxiliary block, then only the two resistances between the first three main blocks are placed in multiple. If the crank is further moved, so that only the crank itself rests upon the second main block, the current goes undividedly through the first resistance.—*L'Elec.*, July 22.

REFERENCES.

Switchboards.—BAXTER.—Continuations of his well illustrated serial of elementary articles on the general arrangement and the construction of switchboards (Digest, Aug. 26).—*Amer. Mach.*, Aug. 17, 24, 31.

Rates for Current Supply.—HUTTON.—A reprint of the whole paper read before the Pacific Coast Electric Transmission Assn., which was abstracted in the ELEC. WORLD AND ENG. July 15, p. 91. A diagram illustrates the method.—*Jour. of El'ty*, July.

Central Station Accounting.—HART.—A reprint of some blank forms which belong to his paper noticed in the Digest, Aug. 12.—*Can. Elec. News*, August.

Stockholm.—A reprint, with some of the illustrations, of the article noticed in the Digest, Sept. 9.—*El'ty*, Aug. 30.

Feed Piping Arrangements.—SCOTT.—An illustrated article pointing out the advantages of the use of water motors in central stations and suggesting a proper feed piping arrangement by which the feed water is always metered.—*Lightning*, Aug. 24.

Wires, Wiring and Conduits.

Aluminium for Conductors.—A comparison of aluminium and copper as a material for conductors. If the conductivities of aluminium and copper are 61 and 97 respectively, the cross-section of aluminium and copper wires of the same length and the same resistance have the ratio 159 to 100, the respective weights have the ratio 48 to 100, and the respective prices 48 *a* to 100 *b*, if *a* is the price of 1 lb. aluminium and *b* that of 1 lb. of copper; with an aluminium and copper wire of the same resistance, the copper having a tensile strength of 50,000 lbs. per sq. in. and the aluminium only 31,446, the same actual load would be required to break either wire. In a table the factors for different values of the conductivity of aluminium, ranging between 54 and 63, are given, by means of which the relative cross-section, weight, tensile strength, and price of aluminium wire can be found from the respective values of equivalent copper wire. Another table gives the comparative weight and strength of aluminium and copper telephone wire of equal conductivity; another, the resistance and tensile strength of aluminium telephone wire; another the dimensions and weights of aluminium and copper wire; another the weight of aluminium, wrought iron, steel, copper and brass wire; another the resistances of pure copper wire; another that of pure aluminium wire; and finally a table for the weights of weatherproof aluminium wire. Some references are made to the relative properties of aluminium and copper wire of equal conductivity when used in the transmission of alternating currents; the self-induction is less with large wire than with a small one, and it is decreased when the wires are placed closed together; if the wires have the same distance in both cases, the self-induction is slightly less in an aluminium circuit than in a copper circuit; if the wires have a distance 25 per cent. greater in an aluminium circuit than in a copper circuit, the self-induction is the same in both cases. Mutual induction is no factor whatever in the choice between aluminium and copper. The increase in temperature is greater in copper wire having less surface, the increased temperature increases the resistance, so that if the wires were of equal resistance when carrying no current, the resistance of the copper wire is slightly greater than that of the aluminium, when they carry equal currents. The capacity being greater with large wires than with small ones, the charging current in an aluminium circuit is about 10 per cent. greater than in a corresponding copper circuit for wires of the same length. (The article emanates from the Pittsburg Reduction Co.)—*Jour. of Elec.*, July.

Safety Suspensions for High Tension Lines.—An illustrated description of the Gould system. The wire for each span between two poles has a loop or stirrup at each end, which is merely hooked but not otherwise fastened, on to a hook secured to the insulator but having its point downwards, so that in case of rupture of the wire, both ends would immediately unhook themselves, thus disconnecting the wire from the circuit as it falls to the ground. Special provisions are made for curves; the new forms are said to have been very satisfactory in practice.—*Elek. Zeit.*, Aug. 31.

Cable Laying on a Bridge.—An illustrated description of the cable laying of the Cambly transmission line, over the St. Lawrence River bridge. The cables for this section are laid in a wooden box placed on the sleepers; they were laid by means of a locomotive, and four flat cars which were loaded with reels, each containing 1000 feet of cable. The cable was paid out over a specially designed cast iron sheave and dropped into the cable box on the floor of the bridge; 26,000 feet of cable were placed ready for jointing in eight hours; the type of joint used is illustrated.—*Can. Elec. News*, August.

Automatic Circuit Breakers.—Scott.—After pointing out the well-known difference between circuit breakers and fuses, and showing that the former has not the "time factor" of the latter, that is, it operates too quickly with a current that has a high value only momentarily, as, for instance, in starting motors—he suggests an improvement in the circuit breaker which consists of a small steel strip resistance, insulated with asbestos and connected in parallel with the main coil; when cold this will carry say about 15 per cent. of the total current; but for a long continued overload which is still too low to release the trigger, the steel strip will gradually become heated, which increases its resistance considerably, thus sending more and more of the current through the main coil.—Lond. *Elec.*, Aug. 25.

References.

Aluminium vs. Copper.—Child.—A short article illustrated by diagrams, giving a comparison of the relative values of the two metals for electric purposes. Insulated aluminium requires about 17.5 per cent. more insulating material than copper wire of the same conductivity. A diagram gives the equivalent price of the two metals, per pound, at which conductors of equal efficiency will be equal in cost (but the diagram does not agree with the table).—*Elec. Rev.*, Aug. 30.

Electro-Physics and Magnetism.

Gaseous Conduction in Incandescent Lamps.—Stark.—Three papers on this subject. The supposition that the hot gases in the bulb of an incandescent lamp convey the current in part, through the lamp, is made very probable by the observation that the current can be tapped by inserting metallic electrodes in the bulb which are not in contact with each other nor with the filament. The gaseous current is subject to deflection by a magnet. There is a striking difference in the behavior of a glowing carbon filament, when charged positively and when charged negatively, a negative charge being dissipated more easily than a positive one, which explains the difference in the attraction exerted by differently charged bodies on the glowing filament and also the unidirectional character of the tapped current through the inserted electrodes. The temperature of the filament is about 1500° C., and the gas acts more as a dielectric than as a conductor at this temperature; but at 2000° C. all gases are probably conductors, and then the lamp acts practically as an arc lamp.—*Wied. Ann.*, No. 8; abstracted in Lond. *Elec.*, Sept. 1.

Currents Induced in Moving Electrolytes.—Blondlot.—A narrow trough with square glass sides was placed between the square pole surfaces of an electromagnet and was filled with two layers of zinc sulphate solution of different densities and therefore of different conductivities. The ends of the trough communicated through tubes closed with parchment paper with breakers containing more sulphate solution, into which dipped the terminals of a capillary electrometer. On exciting the magnet and stirring the liquid at the bottom without disturbing the surface, an e. m. f. was indicated by the electrometer, which disappeared as soon as the stirring ceased or the liquid had acquired a uniform density. Its direction varied with the polarity of the magnet.—*Jour. de Phys.*, July; abstracted in Lond. *Elec.*, Sept. 1.

Phillips Phenomenon.—Walker.—A mathematical investigation of the Phillips phenomenon (see Digest, July 29; Aug. 12, 26). His theory is in general as follows: The electrical discharge produces a number of free atoms, and probably a preponderance of negative atoms, the positive atoms being somehow removed or absorbed by the electrodes. Before the magnetic field is turned on, there is a uniform Maxwell distribution of velocities; but in the field, an initial spin of the free atoms about the axis of the megnetic field is produced, and a new distribution of atoms must result. Positive atoms would get a spin in one direction, and negative atoms in the other, but the investigation is restricted to the case of all the atoms being negative. In the absence of viscosity the mathematics of the question indicates that the density of free atoms must be greatest at the axis of the bulb, and thus the atoms tend to pass from the surface to the axis of the bulb; however, the effect of viscosity and such neutral molecules as remain in the bulb, is gradually to reduce the angular velocity and so finally to restore the condition of uniform density. The luminosity is thought to be due to the collisions of the free atoms as they settle down to their final arrangement.—Lond. *Elec.*, Aug. 18, 25.

Diffraction of Röntgen Rays.—Haga and Wind.—They endeavor to prove that the "interference fringes" produced by Röntgen rays in Fomm's experiments (Digest, Sept. 16) for determining the wave length of Röntgen rays, are nothing but a hitherto unknown optical illusion. They do not reject, however, the possibility of Röntgen rays producing diffraction phenomena and describe a curious periodic broadening of a tapering slit image, which would indicate a spectrum consisting of several bands in the very extreme ultra violet; but the estimated wave length is only 3000 times shorter than that of ordinary light.—*Wied. Ann.*, No. 8; abstracted in Lond. *Elec.*, Sept. 1.

Terrestrial Magnetism.—A short note stating that Liznar has recently made a large number of measurements of the variation of the horizontal and vertical components of the magnetism of the earth with the altitude and has found no agreement with the formula of Gauss. He concludes that one part of the magnetic field has its origin somewhere outside of the earth and that therefore the magnetic elements ought to increase considerably with the elevation.—Lond. *Elec. Eng.*, Sept. 1.

REFERENCES.

Theory of Dielectrics.—BEAULARD.—A reprint in full of his paper noticed in the Digest, Sept. 9.—*L'Ind. Elec.,* Aug. 10.

Nature of Gaseous Conduction.—BOUTY.—A reprint in full of his paper abstracted in the Digest, Sept. 9.—*L'Ind. Elec.,* Aug. 10.

A New Vacuum Phenomenon.—FOMM.—An abstract of the article mentioned in the Digest, Aug. 19.—*Elek. Zeit.,* Aug. 31.

Cathode Rays.—WEHNELT.—An abstract, with three illustrations, of the article mentioned in the Digest, Aug. 19.—*Elek. Zeit.,* Aug. 31.

Coherer.—SUNDORPH.—An abstract, with an illustration, of the article mentioned in the Digest, Aug. 19.—*Elek. Zeit.,* Aug. 31.

Propagation of Electromagnetic Waves.—GUTTON.—An abstract of an Academy paper demonstrating the equality of the velocity of propagation in air and along wires.—*L'Eclairage Elec.,* July 8.

ABRAHAM.—An abstract of a paper describing the experiments of Gutton.—*L'Eclairage Elec.,* July 15.

Flexible Spark Discharges.—LECHER.—A longer abstract, with five illustrations, of the article noticed in the Digest, Sept. 16.—*Elek. Zeit.,* Aug. 31; the abstract in the Lond. *Elec.* is reprinted with two figures in *Elec. Rev.,* Sept. 6.

Electrodynamic Equations.—LARMOR.—An abstract of a theoretical, Royal Society paper on the complete electrodynamic equations of a moving material.—*L'Eclairage Elec.,* July 8.

Induction.—NIKOLAIEVE.—A theoretical article on electrostatic and magnetic induction, and on diamagnetism.—*L'Eclairage Elec.,* July 8 and 15.

Monochromatic Light.—FABRY and PERROT.—An abstract of the French Academy paper on the arc between mercury in a vacuum, mentioned in the Digest, July 29.—*Sc. Am. Sup.,* Sept. 16.

Effect of Magnetism on Conductivity.—MILANI.—Experimental researches to determine the effect on solutions of chloride of iron.—*Nuovo Cimento,* September, 1897; abstracted in *L'Eclairage Elec.,* July 1.

Magnetic Hysteresis.—NIETHAMMER.—A translation in abstract of the article noticed in the Digest, Oct. 29, and Nov. 5, 1898.—*L'Eclairage Elec.,* July 1.

Magnetic Field of a Tubular Current.—DE NICOLAIEVE.—A reprint of his note abstracted in the Digest, Sept. 9.—*L'Ind. Elec.*

ELECTRO-CHEMISTRY AND BATTERIES.

Electricity for Tanning.—BUSE.—A long article pointing out forcibly the great advantages of the introduction of electrochemical methods into the tanning industry; this industry is very extended in France, but no use has been made of the application of electricity, which he claims will hasten the tanning. He mentions some methods which were tried, and describes that of Worms and Balle and that of Groth. The former use a large rotating drum of 2.5 meter diameter, in which the skins are placed along the periphery, a third of the drum being filled with the tanning liquid; the latter uses a rectangular tank, the skin being suspended from a frame above the tank, which has a reciprocal movement. The principal difficulty in electric tanning is to find the best current; he proposes to limit it to between 2 and 4 amperes, preferring 2 amperes; as an empirical figure he gives 0.035 to 0.001 ampere per sq. cm. of the cross-section of the tank. The pressure used in both systems is 40 volts. Keeping the skins in motion preserves the homogeneity of the tanning bath. The method of Burton is also described. Some hints are given for further improvements.—*L'Ind. Elec.,* Aug. 10.

Electrolysis of Platinum Chloride.—DITTENBERGER and DIETZ.—An investigation starting from the facts that during the electrolysis of a solution of platinum chloride, platinum goes to the anode, and that the conductivity of platinum chloride solution is increased by exposure to light. They endeavored to find the chemical nature of the ions into which platinum chloride splits up in the solution. Stannic chloride also shows an anomalous behavior of this kind, a small amount of tin being conveyed to the anode.—*Wied. Ann.,* No. 8; abstracted in Lond. *Elec.,* Sept. 1.

Germain Cell.—A short illustrated description of this cell specially adapted for telegraph, telephone and electric bell work. It consists of carbon in dioxide of manganese, a zinc plate and a compact block of cellulose of cocoanut impregnated with chlorhydrate of ammonium. As the cellulose can absorb a considerable quantity of liquid, a cell can be operated on telephone or electric bell circuits for eighteen months. Curves for the discharge of three types are given: the current furnished by the first type through 200 ohms, decreases from 8 to 5 milliamperes in a continuous discharge in 450 days; the current in the second type through 10 ohms, decreases from 160 to 80 milliamperes in a continuous discharge in 100 days; the current in the third type through 2 ohms and discharged during 300 days, 10 hours per day, decreases from 800 to 300 milliamperes.—*L'Eclairage Elec.,* June 17.

Solution of Platinum and Gold in Electrolytes.—MARGUELES.—In a former investigation he applied an electromagnetic contact breaker to the current from the Daniell cells and placed an electrolytic cell with gold or platinum electrodes between the terminals of the coil around the magnet. With this arrangement the metal can be dissolved in hydrochloric, nitric or sulphuric acid, or in potassium or sodium hydroxyde. The metals always dissolve from the electrode which is the anode to the battery current. The solution is, however, in some way assisted by the current from the magnet, presumably the induced current, as neither a constant nor an intermittent current from the battery alone is capable of effecting a solution. In a recent investigation he found that the dissolution of platinum takes place only at the anode when the action of the electrolyte is hydrogen. In salt solutions the platinum is attacked simultaneously at both anode and cathode. Platinum not only dissolves in the electrolytes previously named, but also in phosphoric, formic and acetic acids; oxalic acid is, however, without effect.—*Wied. Ann.,* Vol. 65, p. 629; abstracted briefly in Lond. *Elec. Rev.,* Aug. 18.

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Cowper-Coles Galvanizing Process.—A brief illustrated description of the plant in course of erection at a government dock yard in Germany for coating boiler tubes electrically with zinc.—*Industries and Iron,* reprinted in *El'ty,* Aug. 30.

Electrodeposition of Tin.—ANDREOLI.—The conclusion of his serial (Digest, April 15).—*L'Elec.,* July 22.

Electrolytic Preparation of Fluorine.—MOISSAN.—A reprint of the paper abstracted in the Digest, Aug. 5.—*L'Elec.,* July 33; *L'Ind. Elec.,* July 25; translated in *Sc. Amer.,* Sept. 9.

Accumulators.—BAINVILLE.—The continuation of his illustrated report of the prize competition for automobile accumulators offered by the Automobile Club of France (Digest, Aug. 5).—*L'Elec.,* July 22.

Primary Batteries.—COOPER.—Some historical notes.—Lond. *Elec.,* Aug. 18.

Origin of the Galvanic Cell.—BERTHIER.—A long article giving a full account of the researches of Galvani and Volta.—*L'Eclairage Elec.,* June 17, 24.

Electrochemistry in 1898.—BORNS.—The conclusion of his article (see Digest, Aug. 26, and Sept. 2); he deals with the progress in the manufacture of silicon, tungsten, iron, carbon, phosphorus, beryllium, aluminium, alkalies and metallic oxides.—*Eng. and Min. Jour.,* Aug. 26.

UNITS, MEASUREMENTS AND INSTRUMENTS.

Work of the German Reichsanstalt.—The first part of a reprint in abstract of the report of the work done by the Reichsanstalt from February, 1898, to January, 1899. The comparison of the two sets of standard resistance coils showed a good agreement, the variations being one to two-hundred-thousandths. Only in one case did the variation of the manganin resistances during eight years, reach 0.00006 (presumably referring to unity); for six other boxes it was only 0.00003 during six years. The measurements with the silver voltameter are stopped for the present. Several standard cells were tested; an investigation of the dependence of the e. m. f. of the cadmium amalgam on its composition showed that the e. m. f. was constant for amalgams containing from 5 to 20 parts of cadmium to 100 of mercury, while it increased by about 0.05 volt from the last mentioned amalgam to pure cadmium. Amalgamated cadmium gives very variable values and should not be used for standard cells. Measurements since 1891 have given the following results for the dependence of the e. m. f. on the temperature: the e. m. f. of the Clark Cell is $1.4328 - 0.00119\ (t - 15^\circ) - 0.000007\ (t - 15^\circ)^2$ international volts; the e. m. f. of the cadmium cell is $1.0186 - 0.000038\ (t - 20^\circ)\ 0.00000065\ (t - 20^\circ)^2$ international volts. The cadmium cell made by Weston has sulphate of cadmium saturated at 4°, but not saturated at ordinary temperatures, and it therefore has an e. m. f. greater by about 0.0005 volt than the cell of the Reichsanstalt, in which a saturated solution containing an excess of the salt is used. The conductivity of solutions was investigated and researches were begun to test with precision certain simple relations between conductivity and concentration. The conductivity of porcelain was measured; as the decrease of the resistance of porcelain and refractive clay at high temperatures can cause mistakes, if the high temperatures are measured at the same time with the aid of the air thermometer and the thermopile, the tests were

made with telephone and alternating currents. The curves representing the resistance as dependent on the temperature, have sharp bends at 900° and 1100°; above these limits the insulating property is already low. The resistance of the tubes at high temperatures was increased by continued heating, and changes in the same way as that of other poor conductors does, when a continuous current passes through them for a longer time.—*Elek. Zeit.*, Aug. 31.

Clark Standard Cell.—A reprint of a very short report of the Committee on Standards of Measurements signed by Carhart, the secretary, and taken from the *Proc. of the A. A. A. S.*, Vol. 47. During the past year the same electrodynamometer as was formerly used by Patterson and Guthe for the redetermination of the electrochemical equivalent of silver, was used to make an absolute determination of the e. m. f. of the Clark cell. Two cells were made by the secretary according to the U. S. legalized specifications. The results of three measurements was 1.4333 volts at 15°. It seems that the values for the electrochemical equivalent of silver, which was used, was 0.0011192-gm per ampere per second. With the Helmholtz electrodynamometer, Kohle obtained 1.4338; Glazebrook obtained 1.4342; making a slight correction in the equivalent used by the latter reduces that to 1.4332, which is practically identical with the value obtained by this committee.—*El'ty*, Sept. 13.

Units.—HOSPITALIER.—A short article in which he favors abandoning the present practical system of electrical units and to adopt instead the pure centimeter-gram-second system, giving these units specific names which are absolutely distinct from those at present used for the practical units. He makes no suggestions concerning these new names except to say that they should be short, euphonic and easily pronounced in all the languages of the civilized countries. He does not favor the suggestion recently made by Blondel to use the old names with the prefix "neo," for some time to come and then afterwards dropping this prefix; this he says is objectionable, because in later years when the names are again the same as they are now, confusion will arise as to which was meant, when reference is made to literature of previous times.—*L'Ind. Elec.*, Aug. 10. (See page 452.)

Measuring the Resistance of Electrolytes.—MCILHINEY.—A description of a quick but not very accurate method, which is based on the fact that if a current passes through two resistances in series, the fall of potential at each is proportional to its resistance. A known resistance is placed in series with the electrolyte to be measured, and the difference of potential at the terminals of the former is measured with a galvanometer, a battery current being used; before this current passes through the electrolyte, it is transformed into an alternating current by means of a rotary pole changer, but it is direct as it passes through the known resistance. (Presumably the fall of potential through the electrolyte is found by subtracting that of the known resistance, from the total; the resistance of the electrolyte therefore includes that in the pole changer.)—*Jour. of the Amer. Chem. Soc.*, 20, p. 206; abstracted in Lond. *Elec. Rev.*, Aug. 18.

Caldwell Interrupter.—TROUTON.—A description of a secondary effect in this interrupter. After the apparatus has been in use the liquid on one side is generally found to be higher than that on the other, but it is not certain at the start on which side the liquid will rise to the higher level; it can, however, be determined by establishing a difference of level at the start, and the action will then continue in the same direction. He explains this as follows: the bubble of vapor which forms in the hole for each current impulse, forms most readily on the side where the pressure is least, that is, where the level is lowest; therefore more liquid will be forced to the side where the level is highest, when the bubble explodes expansively due to the great heat suddenly developed by the breaking of the current; the liquid then rushes in from both sides meeting almost in the middle and there will thus be a transference of the liquid to the side having the higher level. He shows by a calculation that such an action could produce the observed effect.—Lond. *Elec.*, Aug. 18; reprinted in *Elec. Rev.*, Aug. 30.

Dimensions of Electric Units.—SCHREBER.—The proposal to reduce all physical units and measurements to the fundamental units of centimeter, gram and second, has only been fully carried out in mechanics, while measurements connected with sound, light, heat, magnetism and electricity are still based upon arbitrary units. He maintains that their reduction to the fundamental units is an impossibility, because the laws connecting these phenomena with mechanics always contain constants of unknown dimensions which should not be suppressed. It is well known, for instance, that the equations for the attraction of two magnetic masses and for that of two electric masses, contain different constants; if the dimensions of the constants in the former are suppressed, the electromagnetic system of units results; if the dimensions of the constants in the latter are suppressed, the electrostatic system of units results; the consequence is that the same quantity has different dimensions in the electromagnetic and in the electrostatic system of units. The discovery of new relations, such as the action of a magnet upon a current, does not solve the difficulty, since it introduces another constant of unknown dimensions. In the abstract from which this is taken, Fournier d'Albe claims that the whole problem can be solved as soon as the mechanism of the connecting medium is better known, and its own electric and magnetic properties are reduced to mechanical principles.—*Wied. Ann.*, No. 7; abstracted in Lond. *Elec.*, Aug. 18.

A New Wheatstone Bridge.—A long, well illustrated description of a new Wheatstone Bridge devised by Callendar and Griffiths. One of the novel and ingenious features is that the copper leads joining the coils to the plug blocks are especially designed to avoid any alteration in the length of copper due to one or all the coils being in or out of circuit. The most important feature is a method of compensating for the external leads; these leads consist of a stranded conductor composed of four stout, flexible leads carefully interwoven with one another; "two of these leads are connected to the resistance to be measured, and the other two, which are short circuited near the resistance, are placed in the opposite arms of the bridge;" thus any changes in the resistance of the leads due to differences in temperature, are compensated for.—Lond. *Elec. Rev.*, Aug. 18.

Cadmium Standard Cell.—A summary of the information on this cell, known as the Weston cell. The recent article by Henderson in the *Phil. Mag.*, July, is also abstracted.—*L'Eclairage Elec.*, July 22.

REFERENCES.

Storage Battery of 10,000 Volts.—FEUSSNER.—An illustrated paper read before the Electrochemical Society of Berlin, describing the 10,000-volt storage battery of the German Reichsanstalt, consisting of 5000 lead accumulators, which is so constant that galvanometric measurements can be made at this high pressure with the same precision as at low pressures. Some practical hints are given.—*Elek. Zeit.*, Aug. 31.

Russian Weights and Measures.—A short note stating that a new regulation in Russian weights and measures has just been officially published. The metric system is to be optional and may be used on a par with the Russian in commerce.—Lond. *Elec.*, Aug. 25.

Contact Device for Taking Alternating Current Curves.—PEUKERT.—A description of a slight modification of the device of Sahulka described with illustrations in the Digest, Jan. 29, 1898, in order to use it for lecture room demonstrations. This is accomplished by using a double galvanometer, with one dial, but two pointers, one for the pressure and the other for the current.—*Elek. Zeit.*, Aug. 31.

Wehnelt Interrupter.—VOLLER and WALTER.—A longer abstract of the article mentioned in the Digest, Aug. 19.—*Elek. Zeit.*, Aug. 31.

Flicker Photometer.—ROOD.—An illustrated description of the flicker photometer in its present form and a summary of the results of a series of measurements, from which it seems to follow that the accuracy attainable with it, using lights of different colors, almost spectral in hue, is about the same as with ordinary photometers using plain white light, or lights of exactly the same color.—*Am. Jour. of Sc.*, September.

Thomson Bridge.—DUBREUIL.—The conclusion of his illustrated article mentioned in the Digest, Aug. 19.—*L'Elec.*, Aug. 5, 19.

Wehnelt Interrupter.—WEHNELT.—A longer, and illustrated abstract of his paper which was noticed in the Digest, July 22.—*Elek. Zeit.*, Aug. 17.

Measuring the Insulation Resistance of a Battery of Accumulators.—LIEBENOW.—A Franch translation in full of his paper abstracted in the Digest, June 10.—*L'Elec.*, Aug. 5.

Measuring the Potential of Air.—PELLAT.—An abstract of a French Physical Society paper, giving a short description of a "combustion" apparatus which enables variations of the potential of the air to be measured quickly.—*L'Elec.*, July 15.

Method of Measuring Polarization.—HEIM.—A brief abstract of the paper noticed in the Digest, July 2, 1898.—Lond. *Elec. Rev.*, Aug. 18.

Meter.—An illustrated description of Ducretet's modification of Blondlot's meter for measuring quantity of electricity (Digest, Aug.

6 and 20, 1898), accompanied by the theory of its action.—*L'Ind. Elec.*, July 25; translated in *West. Elec.*, Sept. 2.

Meter.—A well illustrated description of a new integrating meter of Johnson and Phillips, for both direct and alternating currents, being in general an electrically-driven clock, actuating the counting mechanism through a gear whose ratio is controlled by the current or the power passing through the meter.—Lond. *Elec. Rev.* and *Elec. Eng.*, Aug. 18.

Meter for Varying Rates.—A description of the system of Brown and Routin, referred to in the Digest, July 8.—*L'Elec.*, Aug. 5.

English National Physical Laboratory.—A note on this laboratory which, like the German Reichsanstalt, is to be founded for standardizing and verifying instruments, for testing materials, and for the determination of physical constants, as an extension of the Kew Observatory, under the control of the Royal Society. Mr. R. T. Glazebrook, now principal of the University College in Liverpool, has been appointed director.—Lond. *Elec.*, Aug. 18; Lond. *Elec. Rev.* and *Elec. Eng.*, Aug. 25.

TELEGRAPHY, TELEPHONY AND SIGNALS.

Measurements of the Microphone.—CAURO.—In the continuation and conclusion of his article (Digest, July 8) he describes the apparatus used for the acoustic measurements, the methods to produce constant sounds, the apparatus for measuring the intensitv of the sounds and the amplitude of the vibration of the membrane of the microphone and of the plate of the telephone; also a full account of his measurements. The results are summed up as follows: To the phenomenon producing the microphone current there corresponds an alternating current in the primary circuit, due to the change of resistance of the microphone, which is superposed on the main current, the effective intensity being a fraction of the intensity of the latter, which remains constant, when the other is varied. For the most intense sound perceptible in the telephone this fraction is about one-quarter. This alternating variation is accompanied by a smaller continuous one, which ought not to take part in the transmission of a musical sound, but probably does in the transmission of articulate speech. The effective intensity of the primary alternating current is nearly proportional to the amplitude of the sound wave and seems to be independent of its pitch. The secondary effective e. m. f. is for open circuit about 1.5 volts for the loudest sounds and varies nearly in conformity with the amplitude of the sound wave; it varies inversely with the period. The effective intensity of the secondary current for the loudest sound transmitted is approximately some 100,000th of an ampere and about a 1,000,000th of an ampere for sounds still clearly perceptible; it is proportional to the amplitude of the sound wave and probably independent of the period. As the displacement of the membrane is proportional to the intensity of the current, it is proportional to the amplitude of the sound wave and independent of the period. The difference of potential at the terminals of the telephone is some 100ths of a volt for the loudest sounds. The maximum power consumed in the telephone is approximately some 1,000,000ths of a watt. The sounds are not effected differently by the telephone, and therefore their "timbre" (quality) should not be altered greatly; the effect of the line in altering the sound, is discussed.—*L'Eclairage Elec.*, June 3 and 17; abstracted in *L'Elec.*, July 15.

Telephone Protection Against Lightning.—KUSEL.—A short article on lightning arresters. To show that contrary to the opinion of many, it pays to instal such arresters, the Bell Co. have figured out that it is worth $1.00 per phone to have good protection. He believes hardly any progress has been made in lightning arresters; the heat coil is not considered to be a step in the right direction; the carbon gap fails under a low discharge of current; magnetic circuit breakers are entirely too slow; fuses are not good for a high potential discharge. The perfect receiver should combine a "fuse and grounding device, a fuse that will blow at under a quarter-ampere of current and a grounding device that under a discharge of current will form a positive ground." For a perfect lightning arrester, one should go back to old principles.—*Elec. Eng'ing*, August.

Wireless Telegraphy in the English Naval Maneuvers.—An article giving some information from a letter of Mr. Marconi. The maximum distance to which service messages were sent was 60 sea miles. It would be necessary to have poles 700 feet high at each end, in order that a line between their summits should clear the curved surface of the earth; the greatest height used above the level of the sea, however, did not exceed 170 feet, so that the Hertz waves either passed over a dome of water 530 feet higher than the top of the masts, or they passed through it. Non-official messages were obtained up to 74 sea miles.

A short article of Commander E. P. Stratham is also reprinted from the *Navy and Army Illustrated.* He says that the experiments proved very satisfactory for the naval service.—Lond. *Elec.*, Sept. 1.

Repairs to Submarine Cables.—HAMILTON.—A communication giving some hints. There is no means of knowing whether the line is intact after the two ends of the conductor are connected and while the joint and final splice are being made. He suggests the following method of testing for such a connection; a long bight of the cable is to be coiled around a suitable drum which is provided with a coil of insulated wire connected to a sensitive galvanometer; he believes that by means of induced currents thus produced it would be possible to find out while on board ship whether the line is intact or not. Special precaution should also be taken to avoid the danger of the cable becoming kinked while this operation is being performed. —*Can. Elec. News*, August; reprinted in *El'ty*, Aug. 16.

REFERENCES.

Transmitting Pictures by Electricity.—Reproductions of some samples of the work done by the Dun Laney machines over a distance of 650 miles from Cleveland to St. Louis.—*West. Elec.*, Sept. 9.

Essentials of Telephone Construction.—REBER.—A reprint of his paper read before the Independent Telephone Association.—*Elec. Eng'ing*, July.

Protection of Telephone Apparatus.—CLAUSEN.—The first part of an illustrated article on the proper conditions under which telephone apparatus should be provided with protective devices.—*Elec. Eng'ing*, August.

Richmond Home Telephone Co.—DOBBS.—An illustrated description.—*Elec. Eng'ing*, August.

MISCELLANEOUS.

Ambroine.—An article on the preparation and properties of this insulating material to which references have already been made in the Digest. It is made of amber and other fossilized copals, mixed with silicates, asbestos and mica. These are all finely pulverized and then agglomerated; on standing, the silicates combine with the copals after which the mass is subjected to a chemical treatment, yielding a paste which is worked and then dried in a vacuum; the material is again pulverized and after being reheated it is placed in the moulds, in which it is subjected simultaneously to high heat and pressure, the latter varying from 100 to 1000-kg per sq.cm. The moulds are very expensive to make which limits the material to being used for articles required in great numbers. One of the important properties is that it does not shrink while in the mould, and it is therefore possible to make all the pieces absolutely alike and therefore interchangeable. The surface is capable of taking a brilliant polish; the material is claimed to be absolutely homogeneous and an insulator of the highest order; a plate 0.34-mm thick was not pierced with 5000 volts. It absorbs even less water than hard rubber, the figures being 1.41 and 0.32. Its mechanical properties are very good; it will withstand 150-kg per sq. cm., while the figures for the best ebonite is only 80; the resistance to compression is also very good; it will also withstand heat and shock and will not become altered in the air. One of its chief applications is for accumulator retaining cells; it is also used for the overhead fixtures for railways.—*L'Eclairage Elec.*, June 24.

REFERENCES.

Italian Electric Workshop.—A short, well illustrated description of the workshop of Brioschi Fiuzi & Co., in Milan, Italy, and of some direct and alternating current dynamos and motors and a rotary converter, made there.—*Amer. Mach.*, Aug. 17.

Carbon Manufacturing Plant.—An illustrated description of the works of the National Carbon Co., in Cleveland.—*Sc. Amer. Sup.*, Sept. 16.

Mechanical Applications of Electricity.—RICHARD.—Some illustrated descriptions of inventions, taken from patent specifications. Among the present he describes Tesla's method of steering vessels at a distance by means of Hertzian waves. Also automatic weighing apparatus and other applications.—*L'Eclairage Elec.*, July 1 and 22.

Electrically Operated Valve Gears.—SWIFT; BRUCE.—Two communications; the first proposing to use electrically driven valves, the second questioning the practicability of it.—*Amer. Mach.*, July 6, Aug. 31.

Wood Seasoning by Electricity.—A brief description of a consular report on the Nodon-Bretonean process which was described in the Digest, Feb. 25. It is said that this process appears to have proved to be a commercial success.—*Sc. Am.*, Sept. 16.

REFERENCES.

Magnetic Separators.—McNeill.—A well illustrated paper read before the English Iron and Steel Institute on some forms of magnetic separators and their application to different ores. The Wenstroem, the Monarch, the Dellvik-Groendal, the two types of the Heberle and the Wetherill machine, are described and illustrated.—Lond. *Elec. Eng.*, Aug. 18, 25; Lond. *Elec.*, Aug. 25.

Speed Regulator.—Mueller.—A brief illustrated description of a regulator in which an ordinary centrifugal governor opens and closes a circuit which then throws in and out the actual regulating device, the power for operating the latter being therefore obtained by means of the current and not from the centrifugal regulator.—*Elek. Zeit.*, Aug. 24.

Electric Heating.—Bainville.—An article discussing briefly the question of electric heating and describing some apparatus, in which there is only radiation, and some in which there is both radiation and conduction.—*L'Elec.*, July 15.

India Rubber.—Tilden.—A note on his artificial production of india rubber, which, however, takes so much time that the process cannot be used commercially.—Lond. *Elec. Eng.*, Aug. 25.

Effect of Currents on the Human Body.—Kath.—A reprint in full of the paper abstracted in the Digest, Aug. 5.—*Elek. Zeit.*, Aug. 24.

Static Electricity in Therapy.—Shoop.—An abstract of a paper read before a medical society of New York.—He discusses its application in therapy and the various methods of applying it.—*El'ty*, Aug. 30.

High Frequency Currents in Medicine.—Apostoli.—A short French Academy paper on the useful application of high pressure currents for the general improvement of the sick, and on the special adaptability of such currents for certain diseases, etc. No technical information is given concerning the application of the high frequency currents.—*L'Elec.*, July 22.

Electrical Machinery at the Como Exposition.—Edgcumbe.—The first part of an illustrated description of some electric machines which were exhibited, and some introductory remarks on the present tendency of Continental European design. Most of the heavy machinery was of Italian make and possessed little novelty.—Lond. *Elec. Rev.*, Aug. 28, 25.

Theft of Electric Energy.—W. Kohlrausch.—A reprint of a paper read before the Union of German Electricians.—*Elek. Zeit.*, Aug. 3.

Waltenhofen.—A biography, with portrait, of Prof. Dr. von Waltenhofen, who recently resigned the chair of electrotechnics at the Technical High School in Vienna, Austria, on account of his advanced age, being born in 1828.—*Zeit. fuer Elek.*, July 16.

Meeting of the Union of German Electricians.—A long detailed account of the annual meeting in Hanover in June. It refers to the business transacted, to the reports of committees, discussions of important questions brought before that national society, etc.; the discussions of some of the papers are also given, but the papers themselves are or will be reprinted separately in that journal and will be noticed in the Digest under their respective headings. Mr. Wilhelm Siemens was elected president for the next year.—*Elek. Zeit.*, Aug. 3.

Iron Ore from Magnetic Separators.—Wiborgh.—A discussion of the question of how to use the finely pulverized concentrates of iron ore and a description of four methods.—*Eng. and Min. Jour.*, Sept. 9.

Counting the Census Electrically.

In regard to counting the returns of the new census, Director Merriam says: "The new census building, in Washington, is one of the most necessary things in connection with the census work. It will be essentially one-story, twenty-one feet in the clear, allowing light on all sides and from overhead. We are planning a great workroom for 3000 clerks. The front part of the structure will be occupied by the administrative building, which will be two stories in height, and will contain 24,000 square feet of floor-space. Here will be the offices of the disbursing clerks, the purchasing agents, and the statisticians, while the main work of tabulation will be done in the one-story structure. It is our present calculation to employ 1000 persons in the work of punching the cards, which will contain the history of every schedule, and then the rest of the force will be employed in the tabulation and printing. We have completed a contract with the Hollerith Tabulating Company to use their electrical machines." The Hollerith system was used in the last census.

New Books.

TELEGRAPHIE ET TELEPHONIE. By J. Pierart. Brussels: Hayez, Editeur. 322 pages, 235 illustrations.

The new edition of this excellent elementary treatise on the telegraph and telephone—or rather, on telegraphic and telephonic science—has been thoroughly revised and considerably enlarged. There are seven chapters, their respective subjects being electricity, primary batteries, magnetism, electromagnetism, telegraphy, telephony and simultaneous telegraphy and telephony; the latter subject is treated more fully than in any English book of which we know, all of the various systems in use in Europe being described in detail.

BOOKS RECEIVED.

Transmission de L'Energie Electrique par Un Fil et Sans Fils. By Emile Guarini-Foresio. Liege: I mprimerie Liegeoise. Henri Poncelot. Paper, 50 pages, 13 diagrams.

Liege: Imprimerie Liegeoise, Henri Poncelet. Paper, 16 pages.

Small Engines and Boilers. A Manual of Concise and Specific Directions for the Construction of Small Steam Engines and Boilers of Modern Types. By Egbert P. Watson. New York: D. Van Nostrand Company. 108 pages, 33 illustrations. Price, $1.25.

Subway Transformers.

Peculiar conditions to be met govern the characteristics of all mechanical or electrical apparatus. There has been a tendency of recent years, in large cities, to remove all electrical conductors from poles, and place them underground. Because of this change of wiring practice, it became necessary to employ transformers not only weatherproof but waterproof.

The General Electric Company at once attacked the problem of manufacturing a transformer that would not be damaged, even though completely submerged in water, as sometimes occurs in a manhole. A complete line of "watertight" or "subway" transformers of sizes 5-kw to 30-kw, inclusive, was developed, and have the high efficiency and superior qualities of the well-known type "H" transformer. As an indication of the favor with which this particular production of the General Electric Company is viewed, we would mention a contract recently closed with a large lighting company.

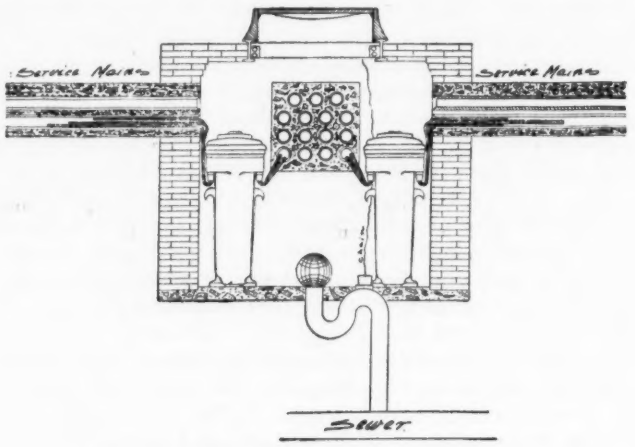


FIG. 1.—SUBWAY WITH TWO TRANSFORMERS.

Having decided to replace 24,000 lights capacity of pole transformers, this company contracted with the General Electric Company to supply the necessary capacity of subway transformers of sizes from 10 to 30-kw.

The transformers are of the standard type "H" construction, with exception of the case. The case is oval in horizontal section, with lifting lugs on the sides so arranged that they will not interfere with the sides of manholes when being placed in position.

The arrangement for carrying the cables into the case is very interesting. The lead-covered cable is passed through a metal bushing, and a plumber's wiped joint made, after which the bushing is drawn tight against a faced seat by a nut on the inside of trans-

former, a special wrench being furnished for this operation. The cover is held in place by a number of bolts, the surfaces of box and cover are machined, and a specially prepared elastic packing to exclude all moisture is used.

Fig. 1 shows diagrammatically two 30-kw transformers as located in a manhole, and Fig. 2 a 10-kw transformer with cover removed.

FIG. 2.—10-KW SUBWAY TRANSFORMER.

The number of bolts for clamping down the cover indicates that the point of an absolutely watertight joint has been most carefully considered. In the cover is shown a short pipe. To this is attached a pipe long enough to reach above the high-water mark of the manhole. This serves for a vent to allow expansion of oil from heat and also to prevent explosion in case of the formation of dangerous gases inside the transformer.

New Types of Theatre Dimmers.

While in the construction of theatre dimmers the electrical factors have been thoroughly considered, and dimmers produced which give a most gradual and satisfactory manipulation of the lights, yet as relates to mechanical make-up the situation has not been entirely satisfactory. There has too often been liability to annoying derangement, and in the event of such derangement or the necessity for repairs of any sort, too little provision made for easy adjustment or replacing of parts. The usual type of theatre dimmer presented the undesirable feature of a number of parts bolted together into an interdependent whole, the removal of any one of these parts necessitating at least partial dissembling of the entire structure.

In the apparatus illustrated herewith, these unsatisfactory features have been eliminated, the principle adopted being to make each unit complete in itself and independent of every other. A bank of dimmers thus made presents, therefore, the condition of an independent framework, so constructed as to be extremely rigid, on which framework the resistance units—of the ironclad type—are independently mounted and attached so that any one may be removed without in any way disturbing any other; or, if so desired, the whole arrangement of the bank may be changed should occasion demand it. All parts are made to gauge or worked to jig, and are interchangeable, which method of construction makes it possible to ship a bank of dimmers "knocked down," this being at times desirable where the dimmers are to be mounted on a platform elevated above the stage, or where the bank is a large one and the shipping distance great.

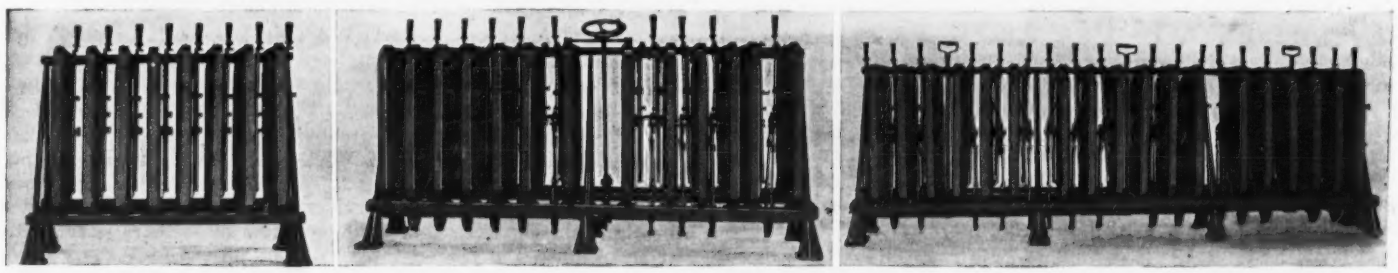
To retain this feature of independence and ease of adjustment in interlocking dimmers, the master shaft has been carried entirely clear of the plates in centering shaft hangers secured to the supporting frames, and provided with ample means of adjustment to compensate for racking due to unevenness in setting or rough handling in shipment. The construction of the frame of angle and tee iron at the same time gives unusual rigidity to the apparatus.

In order to obviate the necessity for absolute alignment of interlocking parts, which has proven so objectionable in the past, the connection between the master shaft and contact levers is made flexible and adjustable; and by transmitting the pull of the master lever to the individual levers over circular sectors, an equal strain is insured in all portions of the arc of movement, and cramping thus rendered impossible. To remove a plate from an interlocking bank it is therefore merely necessary to slack off two turnbuckles and remove the screws attaching it to the framework, when it may be lifted out without interfering with any other portion of the equipment.

It is sometimes desirable to so arrange a bank of interlocking dimmers that movement of the master lever will cause some of the contact levers to travel in the opposite direction while others follow the master lever as ordinarily, thus brightening the lights on one circuit and simultaneously dimming them on others with a single movement of the master lever. This is accomplished in the present instance by simply crossing the interlocking connections in the manner of a crossed belt.

Provision is also made to allow for the setting of individual dimmers in any desired position from full light to no light, and then automatically carrying it from that point by the simple movement of the master lever. This is done by providing a circular arc concentric with the lever stud upon which the interlocking bolt travels before engaging.

The accompanying cuts give a very good general idea of three types of construction in which the principles above set forth are incorporated. The smallest bank shown has eight dimmers of the non-interlocking type mounted upon the independent containing frame. Fig. 2 represents a bank of 13 dimmers showing the same principles applied to an equipment of interlocking dimmers, the master shaft of which is controlled by means of a hand wheel operating a worm engaging with a sector gear upon the master shaft. Fig. 3 shows a bank of 18 interlocking dimmers provided with triple master shafts and triple master levers so as to admit of any desired combination control of the different colored lights used to produce the finest light effects so desirable in the brilliant stage effects of the present day.



NEW TYPES OF THEATRE DIMMERS.

The manufacturers of this new type of theatre dimmer—the Iron Clad Resistance Company, of Westfield, N. J.—inform us that the improved construction has met with immediate appreciation. Within a few months banks have been installed in three of the best theatres in New York City—The Empire, Broadway and Criterion; six banks have been shipped to other parts of the United States and five banks to England and the Continent of Europe, besides large numbers of individual and small groups of unbanked dimmers to various parts of this country and Europe.

NEWS OF THE WEEK.

Financial Intelligence.

THE WEEK IN WALL STREET.—The falling off in bank reserves at the close of last week, due to the demand for money in trade and agriculture, was utilized by the bears for a smashing campaign, pretty much as hoodlums break windows and heads at election time. It looked somewhat like a plot, if worthy that name. The aims of the raiders were fully attained. The net decline in Metropolitan was 12, the closing quotation being 194, against 206 on Friday, and in Manhattan 5¾, 108¼, against 114, the ex-dividend. Third Avenue Railroad lost in sympathy 1⅝, closing at 184⅞, against 186½. The attack was attributed to the combination of operators who within a week have hammered Brooklyn Rapid Transit down from 107½ to 86⅝. This stock was let alone on Saturday, and closed at 88, an advance of ⅜. The drive against values appears to have been based also on the possible unfavorable results of the report of the joint legislative committee which is to investigate the taxable value of the local traction franchises. During the week 7350 shares of Western Union were sold, closing at 88¾, a decline of ⅜, while on 1600 shares, General Electric went off ½ to 122½. The sales of Brooklyn Rapid Transit during the week were no fewer than 726,114 shares, showing a net decline of 16⅛, and on 50,000 shares Metropolitan for the week showed exactly the same heavy decline, closing at 194. In Boston, American Bell Telephone closed unmoved at 360, Boston Elevated at 109. In Chicago, West Chicago closed at 121, National Carbon preferred at 83, Union Traction at 83¼ preferred and 33¼ com. In Philadelphia, Electric Storage Battery closed at 133-140 common and 135-145 preferred; Electric Company of America, 18-18¼; Pennsylvania Manufacturing Company, 28½; Union Traction, 40½; Philadelphia Traction, 99¼. In the New York outside market, the conditions harmonized with the general state of affairs. New York Transportation was offered down, and closed at 20 bid, while New England Transportation dropped to 8¾, and Illinois to 4½. Electric Vehicle was in better demand late in the week, and the stock rallied from 90 to 100, and closed at 97. Electric Boat common was depressed, but the preferred stock was about steady at 43. Electric Axle Lighting closed at 6-6¼.

WESTERN UNION'S EARNINGS.—The Directors of the Western Uuion Telegraph Co. have declared the regular quarterly dividend of 1¼ per cent., as indicated in this column last week. In view of the many contradictory statements in respect to the earnings of the company the following report, just issued, concerning the condition of the company at the close of the quarter ended June 30, 1899, is interesting:

Surplus April 1	$7,855,459.25
Net revenues, quarter ended June 30	1,652,729.93
Total	$9,508,189.18
Dividend of 1¼ per cent. paid July 15	1,216,988.75
Interest on bonded debt	224,272.90
Surplus July 1, 1899	8,066,927.53
Net revenues of the quarter ended Sept. 30, instant, based upon nearly completed returns for July, partial returns for August, and estimating the business for September	1,650,000.00
Total	$9,716,927.53
Deduct interest on bonds	$224,273.00
Deduct dividend of 1¼ per cent. on capital stock issued, about	1,216,988.75
	1,441,261.75
Total surplus	$8,275,665.78

The net revenues show an increase of $122,763 over the same quarter in 1898, and the total surplus an increase of $226,452.

A FLYER IN B. R. T.—An interesting episode in the recent active doings in the New York Stock Exchange was being talked of in Wall Street last week. A well-known broker, it appears, was the heaviest single trader in the stock of the Brooklyn Rapid Transit Company on Friday, when 251,000 shares of this stock were dealt in, with a fall of 7¾ points. Of the total he personally dealt in between 75,000 and 80,000 shares. He traded in and out of the stock for both long and short account, and closed the day with not a share's interest in it either way, and with a net profit of $35,000 for his day's work—a remarkable feat in room trading. The gentleman is one of those who never raised a finger to help develop electric traction, but he can make money out of men who did. He is of those who toil not, and therefore they spin.

CONSOLIDATION AT ERIE, PA.—Application has been made for a charter of incorporation for The Erie Company, which is organized under the laws of West Virginia, with power to carry on a public business of heating, lighting and furnishing power, etc., and is capitalized at $1,000,000, and under the terms of the charter this may be increased to $5,000,000. The corporation officers for the first year are: President, E. D. Carter; vice-president, Louis Streuber; treasurer, Paul Mueller; secretary, John S. Rilling. The first financial operation of this new corporation was to effect by purchase a consolidation of the following plants, together with their existing contracts, good will, etc.; Merchants' & Manufacturers' Electric Light & Power Company, the Erie Gas Company, and the Home Heating Company.

THE PHILADELPHIA LIGHTING DEAL.—A number of details were given last week as to the consolidation of lighting interests in Philadelphia. The new company to be formed will take over the Pennsylvania Manufacturing and National Electric Companies, giving in exchange a collateral trust 4 per cent. bond on the basis of 34 for the former and 15 for the latter, the shareholders of each to be also given rights to subscribe to stock in the new company. The Pennsylvania Manufacturing Company will also make a cash dividend, stated in this column last week, at $2.50 per share, before going into the new arrangement, having the money for this in the treasury. The rights to subscribe to new stock are in the proportion of 100 rights for 150 shares, or two-thirds the holdings, with a call of $2.50 instalment per share.

CHICAGO COMMONWEALTH.—Report comes from Chicago that a direct offer of $5,000,000 in cash was recently made for the property and franchises of the Ogden Gas Company and the Cosmopolitan Electric Company, which is owned by the same interests which own the stock of the Ogden Company. While this offer did not come directly from the People's Gas Light & Coke Company, it is thought that it was made in its behalf. The offer was refused. A counter proposition was made for the sale of the Ogden Gas Company and the Cosmopolitan Electric Company for $6,500,000. This proposition was in turn refused by the persons who had made the first offer of $5,000,000 for the properties.

ELECTRIC VEHICLE DIVIDEND.—The Electric Vehicle Company has declared a 2 per cent. dividend on common stock, payable Oct. 1. This makes the third dividend of the same amount declared during the first year of the company's business. The dividend of 8 per cent., full amount for the year, was paid last spring on the preferred. Dividends paid on stock are derived from royalties and first cash payments made for use of company's rights granted to subsidiary companies.

BIRMINGHAM TRACTION MORTGAGE.—The Birmingham Traction Company, which owns and operates the electric car lines from Birmingham to Gate City and North Birmingham, has filed a deed of trust to the City Trust Company of New York, as trustee, for an issue of $500,000 of bonds secured by mortgage on the company's property. The two roads comprise ten miles of track, modern power houses, new rolling stock, and heavy steel track.

MISSOURI & KANSAS TELEPHONE.—Stockholders of the Missouri & Kansas Telephone Company, a licensee of the American Bell Telephone Company, voted unanimously to double its capital stock, making it $2,500,000, one-half bonds.

ALTOONA STREET RAILWAY SOLD.—Mr. Turner A. Beale stated last week that he had completed a deal involving about $1,000,000, as the representative of a syndicate of New York and Philadelphia capitalists. By it they acquire the City Passenger Railway, the Logan Valley Electric Railway, and the Altoona Gas Company.

ERIE TELEPHONE RECORD.—Last week Erie Telephone & Telegraph sold in Boston at 108, the highest price it had ever reached. The net gain of subscribers for August was 4727, and for the eight months, 28,658. About 5000 new subscribers were waiting to be connected at the beginning of this month.

WESTINGHOUSE DIVIDEND.—The Westinghouse Electric & Manufacturing Company has declared a quarterly dividend of 1¾ per cent. on the preferred stock, payable Oct. 2.

PHILADELPHIA TRACTION COMPANY has declared a quarterly dividend of $2 per share, payable Oct. 2.

ST. LOUIS RAILWAYS INCREASE CAPITAL.—The United Railways Company of St. Louis have filed with the Secretary of State a certificate of increase of its capital from $5,000,000 to $40,000,000. The fee paid was $40,000.

GENERAL ELECTRIC CO. has declared a regular quarterly dividend of 1½ per cent. on the common stock, payable Oct. 14.

Commercial Intelligence.

THE WEEK IN TRADE.—The past week has seen such a demand for money in industries and agriculture that the stock market has suffered, as it always must in a relatively new country like this, where our own financial resources even yet are not equal to the possibilities of development and investment. It must long be so, especially when all the world is opening up to American manufactures, and every other shop is full of foreign orders. All over the country, fall business is good and improving, and the demand for electrical apparatus can only be characterized as extraordinary. Bank clearings reflect a full business week's returns, but also expanding trade, in an aggregate of $1,710,393,268, the largest weekly total reported since July, nearly 25 per cent. in excess of last week's aggregate, 28.7 per cent. heavier than in this week a year ago, 23 per cent. larger than in 1897, 88 per cent. in excess of 1896 and 1894, and 53 per cent. larger than in the corresponding week of 1892. Business failures for the week number 149, against 123 last week, and 173 in this week a year ago, and compare with 169 in 1897, 315 in 1896, and 218 in 1895. For the eight months' period the aggregate earnings of 111 systems of steam railroads amount to $393,225,551, a gain of 9 per cent. over August a year ago, and following progressive and succeeding gains in each year for five years past. Net earnings for July are even better than earlier reports indicated, gross receipts of 80 roads gaining 19 per cent., while net receipts are 26 per cent. larger than August a year ago. So far as electrical business is concerned, the chief drawback is the high price of steel, iron and copper, and the slight prospect of a decline in the two former. Copper is 18½ cents, which a year ago was 12¼. Lead is 4.60 cents, which was 3.97. Heavy steel rail is $32 per ton, which was $18 last September, and foundry pig iron is quoted at $22.25, which was $10.75 a year ago. There will be relief of the copper situation, but it will be some time before steel and iron ease off. Within the past week contractors have been encouraged to look for a partial delivery within a short time. The Metropolitan Street Railway Company has been unable to get the heavy rails which were ordered to replace the present rails in Broadway, Columbus and Lexington Avenues, and the work in installing the electric motive power on those lines may, in consequence, have to go over until next spring. The Third Avenue Street Railroad Company has been fortunate in getting the steel and iron needed for the work of reconstruction in One Hundred and Twenty-fifth Street.

CONTRACTS FOR A BRAZILIAN ROAD.—A syndicate has been formed, consisting of F. S. Pearson, William Mackenzie, of Toronto, and other prominent contractors and engineers, for developing the street railway, light and power interests of San Paulo. The capital is $10,000,000. W. P. Plummer is the New York purchasing agent of the San Paulo Railway, Light & Power Company, Limited. The papers note contracts with a number of concerns. The Pennsylvania Steel Company will supply 40 miles of rails, costing $250,000. The Lorain Steel Company will be given a $30,000 contract for special track construction, including curves and crossings. The J. G. Brill Company will receive an order for 65 cars, estimated to cost $100,000. The American Steel Company will make, at the Washburn & Moen factory, $40,000 of insulator feeder cable. The John A. Roebling Sons' Company will furnish $15,000 of trolley wire and $2000 worth of steel wire. The Stillwell-Bierce-Smith-Vaile Co. are to furnish four special Victor turbines for the powerhouse on the Tiete River, 25 miles from San Paulo, and the Lombard Water Wheel Governor Co. are supplying governors to the value of $5000. The Lidgerwood Manufacturing Company, of Brooklyn, will supply a complete suspension cable way, 900-foot span, including towers, also five 10 by 12 double cylinder, 33-inch friction drum and reversible link motion hoisting engines, with patent full rope carriers, with buttons and fittings complete. Their contract amounts to $15,000. The Rand Drill Company will furnish six 3¼-inch Little Giant drills, also two No. 2 drills, to cost $4000. The General Electric Company will supply two 225-kw generators and a 25-kw motor for running the machine shop, also small machines, which will bring up its order to $10,000 . Thayer & Co. will supply 800-hp Cahall boilers, which will mean an expenditure of $20,000. Other contracts include miscellaneous trolley material from the Western Electric Company and Smith & Wallace, of Boston. H. L. Freeland and the National Bolt & Nut Company will supply nails and bolt spikes. The Morris Machine Company will supply six centrifugal pumps. John Simmons & Co. will furnish wrought iron piping. Patterson, Gottlieb & Hunter, Limited, are executing an order for chain, tools, ropes, and some 50,000 hollow bond plugs. The T. N. Motley Company will forward several blacksmiths' forges and stone sledges. Montgomery & Co. have secured a contract for horseshoers' outfits, railroad picks, screw and hydraulic jacks, crowbars, wrenches, shovels and wheelbarrows. The Contractors' Plant Manufacturing Company, of Buffalo, will supply hand power wrenches. Henry R. Worthington, of Brooklyn, will furnish boiler feed pumps. Keuffel & Esser Company, of New York, have a contract for drawing instruments, levels, transits and the like. The Ohio Brass Company will supply 30,000 bond plugs for the track. The Albert & J. M. Anderson Manufacturing Company, of Boston, have received an order for overhead line material. The Farrel Foundry & Machine Company will send a large stone crusher. The Walworth Manufacturing Company, of Boston, will forward trolley pole fittings, and Elmer P. Morris is to furnish 300 iron trolley poles, manufactured by the Electric Equipment Company. F. E. Huntriss & Co., of Boston, will supply headlights for the cars, and H. R. Teepee will supply wrenches, saws, drills, hammers and the like. These orders, which do not wholly cover the work, give an idea of the way foreign trade can be developed.

LOWER COPPER PRICES.—Promises of lower and cheaper copper come from many quarters, as the inevitable result of the development of production in various mines. Among the most formidable of these are the great copper mines of Rowan and Cabarrus Counties, North Carolina, which furnished all of the copper used by the Confederacy, and which are rich enough in ores, it is said, to supply the world's demand for years. These mines were originally worked for gold exclusively, and were abandoned entirely not long after the close of the war. Boston and New York capitalists, supposed to be backed by great electrical interests, bought them for a song, and have organized the Union Copper Mining Company, under the laws of New Jersey for the purpose of operating them. The capital of the company is only $3,000,000, but it has already begun the erection of an extensive plant, and by Jan. 1 next will be producing 1000 tons of ore a day, which will yield 200,000 pounds of pure copper a day. The company purposes to market the copper in New York at 10 cents a pound, which will give it a profit of four cents a pound. "There is no question that the claims of the copper pool that it can regulate the copper production of the United States and hold the price of copper at present rates are utterly absurd," said Walter G. Newman, president of the Union Copper Company, last week. "We can market copper profitably at 10 cents a pound in New York, and there are new mines being constantly opened."

A BIG PLANT FOR PITTSBURG.—The power house of the Monongahela Light & Power Company, at Rankin, the foundations for which are now completed, is being rapidly pushed to completion. The building will be 95 by 333 feet under cover, with an extension for cold storage. The engines are being built by the Pennsylvania Iron Works Company, and will consist of six pairs of Corliss cross compound, each pair to be 1000-hp under ordinary working conditions, but capable of doing about twice that amount. The boilers will be of the Stirling water-tube type, equipped with Roney stokers. The dynamos are being built by the Westinghouse Electric & Manufacturing Company. There will be three 600-kw, 550-volt machines, designed to furnish railroad power; three 750-kw quarter-phase alternators, and ten 125-light motor-driven arc light units, with the most improved switchboard arrangements. The condensers and pumps will be furnished by the Henry Worthington Company. Heyl & Patterson, of Pittsburg, have the contract for building the coal and ash handling machinery, as fuel will be supplied by rail at first, but it is the intention to add a plant to hoist coal from the river. The building, of brick, will be put up by Steel & Hall, and the truss roof with all the structural work will be done by the Pittsburg Bridge Company. James Bryan is the engineer having charge of the entire work. The cost of the plant will be $500,000, the equipment costing $375,000.

APPARATUS FOR THE CUBAN ELECTRIC COMPANY.—This concern, recently formed in Montreal for the purpose of operating a ferry line running between Havana and Regla, Cuba, and from there on to Guanabacoa, has just closed some important contracts. The Pennsylvania Steel Company will supply $25,000 worth of rails. The Riter-Conley Company, of Pittsburg, has secured the contract for the iron terminal and power stations. Two 150-kw generators will be furnished by the Westinghouse Electric Company, of Pittsburg. Smaller orders for various equipment material are now being undertaken by the J. G. Brill Company, the Lidgerwood Manufacturing Company, the National Bolt & Nut Company, the John A. Roebling Sons' Company, the Contractors' Plant Manufacturing Company, of Buffalo; Henry R. Worthington, and the Albert & J. M. Anderson Manufacturing Company, of Boston; F. E. Huntriss & Co., and the Walworth Manufacturing Company, the Rand Drill Company, the Yellow Pine Company, Thayer & Co., Studebaker Bros. & Co., Thomas McParland, H. L. Freeland, the Morris Machine Company, John Simmons & Co., Patterson, Gottlieb & Hunter, Limited; the Thornton N. Motley Company, Montgomery & Co., the Keuffel & Esser Company, and the Farrel Foundry & Machine Company.

MORSE, WILLIAMS & CO., of Philadelphia, have just finished

the contract for elevators in the Philadelphia Export Exposition. It comprises three electric passenger elevators and one electric dumbwaiter. The outfit is equipped with all modern appliances, and so arranged that while impressing the visitor from abroad likely to place an export order, they give accommodation to the public in reaching the upper floors. The concern have also booked the following contracts recently: E. & T. Fairbanks & Co., St. Johnsbury, Vt., four belt freight elevators; T. A. & L. F. Newman, Brooklyn, N. Y., one electric passenger; Humphryes Manufacturing Company, Mansfield, Ohio, two belt freight elevators; Partridge & Richardson, Philadelphia, one electric passenger; Standard Furniture Company, Seattle, Washington, one electric freight; Pennsylvania Manufacturing, Light & Power Company, Philadelphia, one belt freight; Cluett, Peabody & Co., Troy, N. Y., two belt freights; Diamond Match Company, South African Republic, one belt freight; Locomobile Company of America, Newton, Mass., one belt freight; Cadenas & Coe, for Para, Brazil, one hand elevator; La Fetra Hotel, Washington, D. C., one electric passenger; Lancaster Block, Portland, Me., one electric freight.

EXPORTS OF ELECTRICAL MATERIAL FROM NEW YORK.—The following exports of electrical material are from the port of New York for the week ending Sept. 12: Antwerp—177 packages of electrical machinery $2861; 29 cases electrical material $1307. Aden—3 cases electrical material $89. Argentine Republic—334 packages electrical material $19,760; 16 cases electrical material $29.013. Brussels—5 cases electrical machinery $750. Barcelona—6 packages electrical material $165. Berlin—14 packages electrical material $9540. Bordeaux—4 cases electrical material $85. Brazil—1 case electrical material $60. British West Indies—36 packages carriage material $1237. British East Indies—77 cases electrical material $2924. British Australia—15 packages electrical material $521. British Possessions in Africa—75 cases electrical material $7269. British Guiana—10 packages electrical material $200. Cuba—42 packages electrical material $2395; 2 boxes electrical material $33. Central America—2 packages electrical material $11. Chili—9 packages electrical material $132. Dutch East Indies—2 cases electrical material $150. Dunkirk—11 packages electrical machinery $1500. Ecuador—9 cases electrical material $146. Hamburg—35 cases electrical material $750; 2 cases electrical machinery $297. Havre—80 cases electrical material $18,873; 9 cases electrical machines $469. Japan—4 cases electrical material $753. London—86 packages electrical material $3568; 22 boxes electrical machinery $660. Mexico—1 case electrical material $12. Manchester—22 packages electrical material $2013. Marseilles—36 cases electrical motors $18,000. Madrid—3 packages electrical material $86. Porto Rico—9 cases electrical material $373. Rome—3 cases electrical material $37. Uruguay—6 cases electrical material $99. U. S. of Colombia—29 pckages electrical material $1466. Venezuela—33 packages of electrical material $119; 1 case electrical machinery $10.

CONTRACTS FOR CHARLESTON (S. C.) POWER HOUSE.—Work has begun on the new $150,000 plant for the Charleston Consolidated Company. The contract for the electrical apparatus was given to the General Electric Company. The engines, which will consist of one 500-hp, two 350-hp and two 225-hp, aggregating with the ones now in service a total of 3100-hp, were purchased from the Harrisburg Foundry & Machine Works. The condensers were bought from Henry R. Worthington. The heaters have been ordered from the Wheeler Engineering Company. The boilers have been purchased from the Babcock & Wilcox Company. The railway, lighting and motive power currents will all be generated in this one building. The power house at Sullivan's Island and the one on Marsh Street will both be done away with and the policy of consolidation carried into effect as soon as possible. The structure will be of brick and stone, and there will not be a convenience overlooked. One of the great benefits the city will derive from the new power house is better lights. The entire arc lamp system will be changed. The Consolidated will take down all the arc lights now on the streets and replace them with a new enclosed type.

THE FOREIGN COMMERCE of the United States in the month of August, 1899, is the largest in the history of that month. The exports are nearly 25 per cent. higher than those of August of the phenomenal year 1898, and 33 per cent. higher than the average of August in the years 1894, 1895 and 1896, while for the eight months of the calendar year ending with August they are the highest in our history. The total exports for the eight months ending with August, 1899, were $792,595,332, against $778,632,207 in the phenomenal year 1898, $641,979,330 in 1897, and $602,298,472 in the great export year of 1892. A large part of the growth is in manufactures. The importations for August also show a marked increase, being $66,718,737, against $49,677,349 in August last year, and $39,844,605 in August of 1897. While the details of the August importations are not at hand, the details of the July imports which have recently been completed indicate that the growth in importation is largely in the class of materials used by manufacturers and in tropical foodstuffs.

TELEPHONE CABLES IN FRANCE.—The following, dated Nice, Aug. 11, 1899, has been received from Vice-Consul Piatti: "In the course of an interview which I had yesterday with the Mayor of Nice, I learned that the new electrical tramways which were to be operated about Oct. 15 will, until the 15th of December, be run by horse power. The reason given is that the existing telephonic wires are unable to resist being affected by the current used for the tramways, so that they must be replaced by cables placed underground; but not a single concern, it is said, can be found in France to deliver the necessary cables before Nov. 1. This, in itself, may not be a fact of paramount importance; but reverting to the continuous attempts made by this Consulate to induce our manufacturers to cultivate the very considerable opportunities offered by the port of Nice for a direct trade with the United States, it may not be out of place to say that in this instance, an American firm might have competed with success in furnishing the necessary electric cables."

ON THE COMSTOCK LODE.—A great change is promised in mining conditions on the Comstock lode in Nevada, to follow the introduction of electric power. Twenty-seven mining companies, owning properties in Storey County, and all embraced in what is known as the Comstock group, have contracted to buy power from an electric company at $7 per horse-power. As the power now used by these companies costs about $30 per horse-power, a great saving in operation will be effected, and this, moreover, will make possible the profitable handling of a vast quantity of low-grade ore. This has hitherto been cast aside as not yielding a return over the cost of reduction. Increased activity is promised, and more prosperity than the people of that region have known in many years. Reference is made to this matter in our Pacific coast notes this week.

PLANS FOR A HOUSATONIC PLANT.—Plans and specifications have been completed for the construction of a power plant on the Housatonic River by the Connecticut Lighting & Power Company. It will require more than a year to complete the work, which is to cost about half a million dollars. The beginning of that work is the first actual step taken by the officials of the state trolley "combine" toward a completion of their plans. When the plant has been completed the various trolley lines and electric light plants within a radius of 900 square miles will be operated by power from the Housatonic River. Circuits transmitting the power are to be run to the various towns in the circuit, in some cases forty miles distant. An issue of $5,000,000 in stock and $5,000,000 in 4½ per cent. 50-year bonds is to be made within a month.

LONG ISLAND FORTIFICATIONS.—The electrical equipment of the new fortifications in the district for the eastern end of Long Island is likely to run to respectable dimensions for lighting and power purposes. Mr. H. A. Storrs, formerly professor of electrical engineering in the University of Vermont, at Burlington, Vt., is now assistant engineer, United States Engineer office, New London, Conn., and would like to be favored with circulars, pamphlets and data, etc., as to generator sets, storage batteries, motors, controllers, measuring instruments, conduits, cables, lighting supplies, etc.

WYBRO-HENDY COMPANY, the electrical machinery house in San Francisco, and agents for the Bullock Manufacturing Company for the Pacific Coast, have secured a contract from the Oakland Transit Company for an 800-kw street railway generator, to be direct connected to a cross-compound Corliss engine, operating at 70 revolutions per minute. This is one of the largest dynamos shipped to the coast.

WESTINGHOUSE PLANT FOR BRITISH COLUMBIA.—A new smelter is under construction at Columbia, B. C., in connection with which an electric plant will be put in. The contract is said to have been given to the Westinghouse Electric & Manufacturing Company, of Pittsburg, Pa., for two alternating current generators of 180-kw each. These will be direct connected to a 250-hp turbine.

THE BERLIN IRON BRIDGE COMPANY have been busy on electrical work. They report that they are now erecting the extension for the power plant of the Hyde Park Electric Company, Boston, and that they have received a contract from the Gloucester, Mass., Street Railway Company for a new absolutely fireproof power house.

OPENING IN GERMANY.—J. C. Monaghan, Consul at Chemnitz, has written to the State Department regarding the prospect of electrical plants in Germany. He says a large company has been organized there to build an electric railroad from that city to Burgstaedt, 12 or 15 miles away. As projected, the road is to run through many large and important villages. If continued to Mitweida the distance covered will amount to 30 or more miles.

Special Correspondence.

NEW YORK NOTES.

New York, Sept. 18, 1899.

MR. MARTIN J. INSULL, of the General Incandescent Arc Light Company, New York, sailed last week for England, to be away about six weeks.

MR. H. T. JOHNSON, of the Manhattan Electrical Supply Company, 32 Cortlandt Street, has just returned from a month's stay in the Virginia mountains much improved in health.

SOFT COAL NUISANCE.—The ordinances against soft coal are being enforced on power plants, factories, etc., by the authorities and by counsel of the Merchants' Association, which wants a pure air for this beautiful city. The consumption of soft coal east of the Hudson River has fallen off 3,000,000 tons annually since such legislation went into effect. But with good smoke-consuming devices this need not be, it is urged.

FIRE CHIEF CROKER TRIES AN AUTO.—Chief Croker, of the Fire Department, took a long ride last week on an automobile with the object of testing it to see if it would prove a satisfactory substitute for his horse and wagon in running to fires. The vehicle is propelled by electricity. They rode up Fifth Avenue at a lively speed, and went to fire headquarters, but the chief said he had reached no decision as to whether he would or not select that machine.

NEW BIG BUILDING.—Plans have been submitted for a fourteen-story brick and stone office building, to be erected on the site of the old Niagara Fire Insurance Company's Building, Broadway, corner of Cedar Street, for the St. Lawrence Realty Company, of 149 Broadway. Bruce Price, the architect, estimates that the cost of building will be $700,000. The building when completed will be known as the International Bank Building. It is said that a fine isolated plant will be installed.

PASS & SEYMOUR, of Syracuse, N. Y., owing to the largely increased demand for their porcelain specialties, have been compelled to look around for larger manufacturing facilities, and will in the near future erect a new factory with at least double the capacity of their present quarters. When they obtain occupancy of their new factory, Pass & Seymour will largely increase their electrical line and will manufacture also a new line of goods for other important purposes besides electrical.

AN AUTOMOBILE AMBULANCE.—It is reported that a wealthy resident of this city is having built an automobile ambulance for St. Vincent's Hospital. The ambulance, which will be propelled by electricity, will be the first of its kind in the city. The new vehicle will be a model of its kind, and is expected to be a great improvement over the ambulances now in use, having a much steadier motion, and, if required, more speed, than those drawn by horses. The large tires, it is also expected, will contribute in no small way to the comfort of a patient.

NEW HUCKLEBERRY ROUTE AT PELHAM.—The Union Railway Company has made application to the village of Pelham for a franchise over the old Boston Post road. The route which the company seeks to secure begins at Wolf's Lane, and joins the main line of the company at New Rochelle. The westerly end of the road connects with the proposed line to be built through Sixth Street, Mount Vernon, and across Hutchinson's River, by means of one of the new bridges, and its easterly end passes the Holy Sepulchre Cemetery and the Woodside Station of the New Haven branch road.

CUTTING LONG DISTANCE WIRES.—John Mitchell was held for examination in the Morrisania Court last week on the charge of malicious mischief. He and confederates were caught in the act of cutting the copper telephone wires at that point. They had taken out a section of a hundred feet or more from the main wire that connects New York and Chicago. One of the men got away and Mitchell ran to the Harlem River and jumped overboard. He was captured. The telephone company reported the total stoppage of communication for an hour and considerable annoyance for another hour at a great loss to the company.

ELECTRICITY VERSUS WHISKERS.—A "ukase" against whiskers in general has been promulgated in a general order issued by Trainmaster Abraham L. Merritt, of the Manhattan Elevated. Conductors and trainmen must hereafter refrain from cultivating the least suggestion of facial adornment, barring a mustache, which is not included in the momentous ban. Speculation was rife last week among the conductors as to the meaning of this order. The danger of flowing beards and whiskers becoming tangled up in the new electrical machinery soon to be installed in the system by the management, was wildly alleged to have given rise to the order.

MR. T. M. MESTON, secretary of the Emerson Electric Manufacturing Company, of St. Louis, has been making a tour on general business through the eastern states and has been spending a large part of his time in New York. The Emerson Company, as a pioneer builder of alternating motors, finds much to interest it in the present situation as to current transmission and distribution. Mr. Meston gives data as to an enormous growth in the Emerson output and speaks very hopefully as to some of their developments in the near future. He has had an unusual range of experience in the mechanical and hardware fields, which inures greatly to the benefit of his company in marketing its product.

MR. HENRY SHAFER, the general manager of the Stromberg-Carlson Telephone Manufacturing Company, was in New York last week. His company has on hand at the present time orders aggregating nearly half a million dollars' worth of business and, with the natural increase of work in the telephone line, his company is preparing to do about a million dollars' worth of work in the next season. With this in view, Mr. Shafer's trip has been for the purpose of buying certain material in the east, and his company will be found in very good shape to take care of their present and forthcoming orders. This company has been very successful in selling instruments to exchanges in foreign countries.

NEW ENGLAND NOTES.

Boston, Sept. 18, 1899.

FALL RIVER, MASS.—The Fall River Shore Line Street Railway Company has been organized, with a capital stock of $500,000.

HALIFAX, N. S.—The Halifax Electric Tramways has been authorized by the town council to obtain parliamentary powers for extending the road. The cost of the proposed new road is estimated at $110,000. Considerable new machinery and electrical equipment, as well as rolling stock, will be required.

WESTFIELD, MASS.—The United Electric Construction Company has been organized at Kittery for the purpose of operating telephone lines and other electrical devices between Westfield and Fairfield, Mass., and other points, with $200,000 capital stock, of which nothing is paid in. The officers are: President, Henry E. Roberts, of Medford Hillside, Mass.; treasurer, George B. Perkins, of Medford, Mass.

BOSTON TO WORCESTER.—There is every prospect that the electric line projected by the Shaw interests to run from Brookline to Worcester, 35 miles, will be an early reality. The name of the new corporation is the Boston & Worcester Street Railway Company. The route will begin at Cypress and Boylston streets in Brookline and extend through Brookline, Newton, Wellesley, Natick, Framingham, Southboro, Northboro, Westboro and Shrewsbury. This is one of the boldest enterprises of the kind undertaken in the state, but the promise of success is so great that every dollar of the capital stock—$750,000—has been taken. It is proposed to maintain a through service between terminal points, a feature that will recommend the line to the trolley car tourist. The equipment of the road calls for 75-pound T-rail and double truck air-brake cars.

PHILADELPHIA NOTES.

Philadelphia, Sept. 18, 1899.

CHARTER FOR SHORT LINE.—A charter has been issued by the state department to the Millersburg Railroad Company to build a two-mile line in Jefferson County. The capital stock is $20,000. F. S. Lewis, of Philadelphia, is president.

THE NOVELTY ELECTRIC COMPANY, of this city, are preparing for general distribution a very handsome catalogue that will be devoted exclusively to electric light material. It will be remembered that this same concern issued last spring an elaborate catalogue on house goods.

THE HELIOS-UPTON COMPANY has filed articles of incorporation. The objects of the corporation are to manufacture electrical machinery, etc. The capital stock is $500,000, and the amount paid in is $450,000. The corporators are Frank S. Marr, King Upton, Thomas Spencer and George H. B. Martin, well known in the electrical field.

MR. H. P. FEISTER.—The many friends of Mr. H. P. Feister, proprietor of the Franklin Electric Supply House, Philadelphia, Pa., will regret to learn that Mr. Feister has been confined to his home by sickness for the past two or three weeks. We understand, with much pleasure, that Mr. Feister is improving and that he will soon be back to his place of business again.

OBJECTED TO BROOKLYN MEN.—General Manager Walter, Superintendent Uhl, several despatchers and crews of Albert L. Johnson's Lehigh Valley Traction system, quit work on Sept. 16 because Mr. Johnson had appointed some Brooklyn men to important posts on the line in place of local men who were discharged. The changes were very unpopular with the patrons of the road, and when President Johnson visited Allentown and refused to recede from his position, General Manager Walter and Superintendent Uhl resigned.

WESTINGHOUSE SHOPS.—It is understood that the Westinghouse arc lamp manufacturing will hereafter be done at Newark, N. J., where the company has so long had control of the old United States Company's shops, etc. The Pittsburg shops thus released will, it is said by officials, be devoted to the manufacture of automobile motors, at the rate to start with of fifteen a day. Westinghouse motors have given excellent service under the vehicles in Philadelphia and New York.

ALLEGED WESTINGHOUSE CONSOLIDATION.—Electrical circles in Pennsylvania, as well as elsewhere, were rather puzzled at the news of an alleged Westinghouse deal. It has now been officially denied that the Westinghouse Air Brake Company, Machine Company, the Electric & Manufacturing Company, Standard Underground Cable Company and other Westinghouse interests at Pittsburg would be consolidated into one organization, to be known as the Westinghouse Company, with a combined capital of about $100,000,000. The chief underlying interest is considered enough to insure all the harmony and smooth working that are needed in those great industries, which have always worked "hand and glove."

MR. M. E. FULD, general manager of the Chloride of Silver Dry Cell Battery Company, Baltimore, Md., is about to fill in the balance of 1899 by putting a belt around the United States, in the interests of his company. Starting about Sept. 25, he will go eastward through New England, and thence to Quebec, Toronto, Montreal and the great lakes toward Cleveland, Detroit, Milwaukee, Chicago and St. Paul, and so on toward Portland, Seattle, Vancouver, Spokane, 'Frisco, Los Angeles, San Diego, and from there homeward again, via New Orleans, Memphis, Louisville, St. Louis and Cincinnati. Mr. Fuld contemplates a trip of at least 15,000 miles, and will visit almost every city in the Union of any commercial importance. This is certainly strong evidence of a healthy condition of business in chloride of silver dry cell batteries. Although their goods are principally for physician's use, and are largely marketed through the surgical instrument and drug trade, the chloride of silver testing apparatus is known to every large electrical manufacturing house, as well as every telephone and telegraph interest throughout the length and breadth of the land.

CHICAGO NOTES.

Chicago, Sept. 16, 1899.

MR. WILLIAM M. PORTER, who is now established as a first class electrical engineer at 841 Spitzer Building, Toledo, Ohio, was on a business trip to Chicago this week.

MR. H. E. TEMPLE has resigned the management of the Modern Electric & Manufacturing Company, 204-206 Indiana Street, this city, to be succeeded by Mr. E. B. Webster.

MR. H. B. KIRKLAND, representing the American Circular Loom Company, of Chelsea, Mass., has been visiting the "Windy City," and reports that his company is receiving a goodly share of the prevalent prosperity.

MR. G. G. LUTHY, general manager of the Royal Electric Company, Peoria, Ill., is visiting Chicago, in the interest of his company this week. He reports that their factory is running night and day, and that orders still continue to pour in.

THE DEXTER SAFETY DEPOSIT COMPANY, Dexter Building, this city, recently purchased a 100-kw Western Electric belted generator. The construction department of the Western Electric Company installed the generator and switchboard.

JOLIET, ILL.—F. E. Fisher, secretary of the Chicago & Joliet Rapid Transit Company, announces that the company will extend its electric street car lines from Lockport to Lemont, Cook County, and that it is expected the line will be extended to Chicago.

PEORIA, ILL.—The incorporation papers of the Chicago, Keokuk & Southwestern Railway Company and an amendment changing the name to the Peoria & Keokuk branch of the United States Railway Company have been filed. The incorporation papers were issued in 1891, and the change was made in 1899. The capital stock is $1,000,000, and the object to run an electric line between Peoria & Keokuk.

RAISING TAX VALUES.—The Board of Review closed a record-breaking week by raising the schedule of the Chicago Telephone Company $2,112,000. After raising the packing houses' schedules $4,300,000, the members of the Review Board still thirsted for more gore and selected the Telephone Company as the next victim. Its schedules for city and country towns footed $1,688,000. The tax men raised this total to $3,800,000.

MR. W. L. ARNOLD, manager of the Arnold Electric Power Station Company, was married on the 7th inst. to Miss Ida Evans, daughter of Colonel George W. Evans, of Mount Vernon, Ill. They have left for a cruise on the lakes, and will be at home at the Hyde Park Hotel, Chicago, Oct. 1. Mr. Arnold has many friends throughout the electrical fraternity, who extend their congratulations, wishing him much happiness and joy.

AN ENGINEER EQUAL TO AN EMERGENCY.—Some nights ago Mr. Elmer Fraser, night engineer of the electric light plant at Hudson, Mich., while at work in the dynamo room, was startled by hearing an alarm whistle sound announcing low water in the boiler. Realizing instantly the situation, he climbed to a big tank from which the boiler received its supply of water and, diving to the bottom, found the outlet closed up by a rubber valve, which he removed.

THE WATERTOWN ENGINE COMPANY, of Watertown, N. Y., has opened an office in Chicago at 900 Fisher Building, which will be in charge of Mr. F. H. Pond. Among their recent sales they report one for their new vertical direct-connected high speed engines to the Deering Harvester Company, three vertical cross-compound condensing engines to the Pennsylvania Railroad Company for their Fort Wayne shops. Also two 7 by 7 vertical engines direct-connected to Westinghouse generators.

PETER PEARSON, OF PERRY'S, PROMISES.—Peter Pearson, of Perry, Okla., has invented a system of wireless telegraphy which, he alleges, is perfectly successful. Some time last week he sent a message to his agent in a little town 60 miles away. He later received a copy of the message by letter through the post office, exactly as he sent it, including a mistake in the sending. He says that it fully demonstrates the soundenss of his theories and he promises that the time will come when people will converse through the air as they do now through the medium of the telephone. Details are sadly lacking.

TELEPHONE PERMIT DELAYED.—The granting of a permit to the Illinois Telephone & Telegraph Company to construct a conduit in several streets in the city has been temporarily stayed until the city engineer and the law department can look up the matter. The plans have been submitted to City Engineer Ericson with a request that he give an opinion as to the result of the conduit on the foundations of buildings, and the erection of a subway for traffic purposes. Mr. Ericson believes there will be no damage to foundations by reason of the conduit, which is to be placed 25 feet under the street, but has not yet made any investigation of the subway feature.

THE STERLING ELECTRIC COMPANY, 71 West Adams Street, may remove its plant to Lafayette, Ind., early in October. W. E. Doolittle, general manager of the company, said, when interviewed: "I can't tell definitely when we shall move to Lafayette, as we have not yet had a meeting of stockholders. but it will be some time in October. We shall retain our present plant here, but will have the main part of our business located in Lafayette, and may make that city our headquarters. We are comparatively a new company, having been incorporated in February, 1898. Our capital stock at that time was $30,000, and we started with a force of only nine men. At present we have 130 men on our pay roll, and we are working night and day to turn out our orders. Our floor space, about 7000 square feet, is not adequate to our needs, and we felt compelled to enlarge our business. We have bought the old Lafayette car works from William Wallace, and the Lafayette people have taken $40,000 in stock. We will have 50,000 square feet of factory room in the Indiana city, and will employ 150 to 200 men to start with. We manufacture everything in the way of telephones, except wires and poles, and have the satisfaction of being the only independent firm that has ever sold to the Bell Company."

PITTSBURG NOTES.

Pittsburg, Sept. 18, 1899.

THE ALLEGHENY TELEPHONE COMPANY, of Braddock, Pa., has purchased all the stock of the Homestead Telephone Company.

THE MONONGAHELA PLANT.—Work on the new central station plant of the Monongahela Electric Light & Power Company, at Rankin, is rapidly advancing, and the management expects to be able to furnish light and power by the first of the new year.

HENRY S. JARVIS, manager of the Dunkirk Copper Company, of Butte, Mont., was in this city last week. He stated that owing to the increased demand for copper in the construction of electrical apparatus, the price is constantly advancing, all the mines in the northwest being operated to their full capacity.

FRIEDRICH EICHBERG, professor of electro-technique of the University of Vienna, Austria, was in the city a few days ago. He has come to this country on a mission to study American methods of applying electricity. Professor Eichberg spent several days at the factory of the Westinghouse Electric & Manufacturing Company.

MR. G. H. BLAXTER, who is well known in electrical circles as the former vice-president and general manager of the Allegheny County Electric Light Company of this city and of the Brush Electric Light Company, of Baltimore, Md., which positions were held by him at the same time, is now in Europe on a visit to the home of his childhood in Derbyshire, England.

COLORADO NOTE.

Denver, Sept. 8, 1899.

COLORADO SPRINGS-CRIPPLE CREEK RAILWAY.—Plans are under way for the construction of a new electric road between Colorado Springs and Cripple Creek, Col. The object is to give better facilities for handling the increasing traffic of one of the most remarkable gold mining camps in the world. The main line from Colorado Springs to Cameron will be operated by steam, but electricity will be adopted from Cameron, where a power plant will be installed, on through and connecting all the principal mines and points throughout the Cripple Creek district, enabling shippers to load their ore direct from mine to cars without long hauls with teams. The route as laid out will make the line 35 miles long. From Colorado Springs the survey runs through about the same country as the Cheyenne road to the half-way house, and the maximum grade will only be about 3½ per cent. From that point to the Cameron terminus the grade will average 2 per cent. Messrs. Irving Howbert and James F. Burns, of Colorado Springs, are the promoters of the enterprice.

OHIO NOTES.

Cleveland, Sept. 16, 1899.

THE BOWLING GREEN TELEPHONE COMPANY, of Bowling Green, has been incorporated for $10,000.

THE CARBON PLANT of the Thomson-Houston Company, at Fremont, Ohio, has been purchased by the National Carbon Company, of Cleveland. The value of the plant was $100,000.

THE HOME TELEPHONE COMPANY and the Bell Telephone Company at Burton are engaged in a lively rate war. The Home Company has just reduced its rates for individual lines to $12 per month within the county.

SIPE & SIGLER, the well-known Cleveland manufacturers of batteries, have closed a contract with the Fischer Equipment Company, of Chicago, for $120,000 worth of batteries for electric carriages. The company is now delivering these goods at the rate of six sets per day.

THE LINCOLN ELECTRIC COMPANY, Cleveland, reports a very large run on its small motor, especially adapted for electric vehicle purposes. The Kensington Company, of Buffalo, which has recently gone into the manufacture of electric carriages, is using a number of these motors.

THE CLEVELAND AUTOMOBILE SUPPLY COMPANY, which is to conduct an automobile riding school, livery, repair shop and club house in Cleveland, has taken the agency for the Stanley steam carriage which is manufactured by the Locomobile Company of America, Newton, Mass.

CLEVELAND & MEDINA.—Work is to be resumed on the Cleveland, Medina & Southern Electric Railway. The construction of the line was commenced over a year ago, but it was abandoned through lack of capital. Additional backing has been secured and the road will be completed at once.

THE NORTHERN OHIO TRACTION COMPANY has filed a mortgage for $3,000,000 to the Central Trust Company, of New York. H. A. Everett, president of the company, stated that $1,500,000 would go to the Akron Traction Company and $1,000,000 to the Akron, Bedford & Cleveland Electric Railway Company, both roads having been absorbed by the first mentioned company, while the remaining $500,000 will revert to the treasury of the company.

THE CLEVELAND & EASTERN RAILROAD COMPANY has transferred all its property to the Cleveland & Eastern Railway Company. The value was $50,000. The last spike in the main line of this road between Cleveland and Burton was driven this week. On account of the inability of electric companies to furnish overhead equipment at once, it is probable that the road will be operated by steam power for a short time. It is the intention of the company to extend its road through Windsor, Orrville and Jefferson to Ashtabula where it will connect with a new extension of the Cleveland, Painesville & Eastern. A part of the right of way has been secured through the purchase of a branch line of the Pittsburg & Western Railroad from Burton to Windsor.

THE TWENTIETH CENTURY AUTOMOBILE COMPANY, of Cleveland, has been incorporated for $100,000 by Mathew Zeman, Thomas Woefel, Stephen B. Melzer, Vaclav Krejac, Joseph M. Aebel, John Volk and Edward Peterka, to operate automobile busses in Cleveland. The organization of the company is an outcome of the strike of the Cleveland Electric Railway employees. The new concern has placed orders for a number of gasolene automobile busses, the first sample having been delivered. The vehicle is 20 feet long and 6 wide, with seats for 32 passengers and standing room for 20 more. It has rubber tires and will be heated in cold weather. The vehicles will be operated by strikers and will parallel the boycotted lines, working in conjunction with the busses already in operation. But the strike is over.

CINCINNATI NOTES.

Cincinnati, Ohio, Sept. 16, 1899.

MANAGER CAMPBELL, of the Stewart Electric Company, says business is excellent and improving all the time. Two big deals are pending for municipal lighting plants and street railway work.

PRESIDENT E. V. CHERRY, of the Standard Electric Company, is still in Denver, whither he went about a year ago for his health. Encouraging reports come from the local office. One large contract just secured is the furnishing of most of the supplies for the electric work in the big Union Trust Company Building, at Fourth and Walnut. The company is just finishing up a contract for the supplies which went in the new Columbia Theatre, on Walnut Street. A. M. Schulman is the contractor for both the jobs mentioned.

MR. A. M. SCHULMAN, the Cincinnati contractor for electrical equipment, has secured the contract for fitting out the new eleven-story building of the Union Savings Bank & Trust Company, which is expected to be begun some time during the coming fall. The contract amounts to $25,000, and calls for a complete system of electrical apparatus from dynamos to bell attachments. There will be 3500 incandescent lamps, seven motors with an aggregate of 35-hp to be used in driving the electrical fans, ventilating apparatus, etc. A refrigerating machine will be one of the improvements, to furnish tenants with ice water at all times.

VICE-PRESIDENT JOSEPH NEAVE, of the Bullock Electric Manufacturing Company, is feeling very good over the reception of an order for a 2000-kw direct-connected generator to supply power for the General Machinery exhibit at the Paris Exposition. It will be a monster machine and with it goes a switchboard and all necessary connecting appliances. The generator will be ready for shipment in about two months. The company is making several other small generators for other parts of the world. The Bullock Company will be well represented at the Paris Fair. The concern will have a space 32 by 12 feet in Section 13 of the Machinery exhibit. President George Bullock is expected to return from his vacation about Oct. 1.

INDIANA NOTES.

Indianapolis, Sept. 16, 1899.

THE CENTERVILLE TELEPHONE COMPANY, capital $10,000, filed articles of incorporation with the secretary of state on the 6th inst. The company will build and operate a telephone plant at Centerville.

AUTOMOBILE LICENSE.—The ordinance relative to a vehicle license tax has been amended by the council of Indianapolis so as to include automobiles, and provides that the license fee for such a vehicle shall be $3 a year.

ELECTRIC LINE PROJECTOR INSANE.—Noah J. Clodfelter, of Indianapolis, heretofore regarded as a successful promoter of interurban electric railways, has been declared insane by a commission. His delusion is that he is immensely rich and has vast sums of money at his disposal. He shows papers and miniature bonds which, he says, represent $8,000,000 belonging to him.

THE GOSHEN & INDIANA TRACTION COMPANY, with $200,000 capital, filed articles of incorporation with the secretary of state on the 5th inst. It proposes to build an electric line from Goshen to Angolia, through Steuben, Lagrange and Elkhart counties, that will be 54 miles long. Goshen and Angolia capitalists are behind the scheme.

THE NATIONAL TELEPHONE COMPANY, which operates in Auburn and has a line to Fort Wayne, is rapidly extending its line to Butler, where the line will connect with those of the Butler and United States companies. This will give the Butler Telephone Company connections as far east as Cleveland and into southern Michigan, and to Fort Wayne and nearby towns in northern Indiana.

MISCREANT AMONG TELEPHONE WIRES.—Twice within two weeks attempts have been made to damage the New Telephone plant at Indianapolis. On the last occasion the building was entered and the wires connecting the switches were cut off in the terminal room; the batteries turned off, and the watchman assaulted. There is no clew to the identity of the miscreant, but he is evidently well acquainted with the plant and had a key to the building.

THE TERRE HAUTE LIGHT PROBLEM.—The proposition submitted by a Chicago firm to build an electric light plant for which the city is to pay in instalments on the rental plan, each year's charges for lighting the streets to be put high enough to make the sale in this manner profitable to the contractors has been reported on adversely by the Lighting Committee, but the council has postponed action for two weeks. The citizens are about equally divided over the matter.

NEW WINTER CARS.—The Indianapolis Street Railway Company has begun to manufacture new winter cars at the company's shops, and as an indication that the old cars will no longer be used they are being given free to anyone who will haul them away. At present nothing but the bodies of the winter cars will be made, and they will be fitted to the new double trucks now used under the summer cars. The iron market will not admit of the purchase of new trucks in time for early winter service.

COMPETING TELEPHONE COMPANIES.—The plant of the Home Telephone Company, at Richmond, is now completed and a fierce competition between that company and the Central Union has begun. The Home Company is promoting independent exchanges in all the towns of the county and also promises independent lines to other towns and cities easily accessible. At the same time the Central Union is preparing to meet this competition by rebuilding and constructing new lines, having just completed a line between Richmond and Dayton, Ohio. The citizens seem to enjoy the competition and relish the benefit of an almost free service.

PACIFIC COAST NOTES.

San Francisco, Cal., Sept. 11, 1899.

THE CITY & SUBURBAN RAILWAY COMPANY, Portland, Ore., has commenced work on a new electric line on Mississippi Avenue, which will accommodate the residents of the Multnomah addition.

THE "CHEAP POWER CONTRACT" has been signed by all of the mining companies on the Comstock Lode, and the erection of a large electric power plant is now assured. The Truckee River General Electric Company will supply the power from a water power plant to be erected near Floriston, Nev. A celebration will be held in Virginia City.

MR. ROY GRAY, of Pasadena, Cal., who is assistant inspector for the Sunset Telephone & Telegraph Company, will go to Arizona to make a survey for the long-distance lines to be installed in that Territory. The first long-distance line to be constructed will be one connecting Tucson and Phoenix, the distance being 72 miles. An extension of 135 miles to Prescott will be made later on. There are local exchanges in several Arizona cities.

THE YUBA ELECTRIC POWER COMPANY, Marysville, Cal., has recently completed the 64-mile transmission line from the new power station to Sacramento. The system is now ready for operation, the voltage of transmission being 23,000 volts. The current will be used to operate street cars, etc., by the Sacramento Electric Gas & Railway Company. It will supplement the current from the Folsom power house, which is transmitted to Sacramento.

THE SAN FRANCISCO "CALL" has for some weeks been carrying on experiments in wireless telegraphy, and very satisfactory results have finally been obtained. The aerial wire and zinc cone at the receiving station have been done away with and still messages are received at the Cliff House from the lightship 8 miles out at sea. The primary object of the installation of the apparatus was to obtain the first news of the arrival off the heads of the transport Sherman, carrying the First California Regiment. Operator Charles M. Fisher was in charge of the sending station on the lightship. Mr. Lewis McKissick, circuit manager of the Western Union in Sacramento, Cal., acted as receiving operator at the Cliff House. Others who have contributed to the success of the system are: Frank C. Broili, who supervised the making of the coils; George Otis Mitchell, professor of physics in the Girls' High School, and Henry Walters, chief engineer of the Claus Spreckels Building.

ST. LOUIS NOTES.

St. Louis, Mo., Sept. 16, 1899.

ODESSA, MO.—A proposal to raise $10,000 in bonds for the city ownership of electric lights was voted on last week and carried by an overwhelming majority. It is thought the plant will be in operation by Dec. 1.

THE VAN-ETTEN-LYONS ELECTRIC COMPANY, capital stock $5000, all paid, was incorporated Sept. 5. The stockholders are Scott Van Etten, Harry E. Lyons, Amy Carter and Arthur B. Donnelly. They will do a general electrical business.

A TELEPHONE WAR is being waged at Marshall, Mo., between the New Satine County Company and the Missouri & Kansas Company. Rates are cut to 50 and 75 cents a telephone per month. The new company is employing about 50 men in the county.

THE KINLOCH TELEPHONE COMPANY has recently made large extensions in its local service, involving an additional expenditure of $212,000 on its switchboard facilities. Their Kellogg switchboard is now the largest telephone apparatus of this kind in the world.

THE CITIZENS' ELECTRIC LIGHTING & POWER COMPANY.—This company, which is kin to the Kinloch Telephone Company, will be in operation before winter. They now have a conduit laid and poles planted. The power house will be built and cables put in this fall.

FRANCHISES FOR NEW ROAD.—The Village Board of Smithton last week granted a franchise to the Interurban Electric Railroad Company to construct a road there as part of a line to Belleville, the fare between the two points not to exceed 10 cents. A bond of $10,000 must be given by the company.

ASKS LEAVE TO STRING WIRES.—The St. Louis Railroad Company made application this week to the Supervisor of City Lighting for permission to string trolley, span and feed wires along certain portions of Broadway. The changes are being made under the provisions of an ordinance that was passed by the Municipal Assembly last winter.

MR. C. NESBIT DUFFY, late auditor of the Hamilton syndicate lines in this city, has been given the position of auditor for the Chicago City Railway Company, now under Captain McCulloch's general managership, and will assume his new duties at once. He has been associated with Captain McCulloch here for many years, and follows him now to Chicago.

NEW ELECTRIC RAILWAY AT JOPLIN.—Word comes from Joplin, Mo., that a new electric railway company has applied to the city council of that

city for a charter to build its lines through Joplin. The new road, if granted a franchise, will be built from Joplin to Belleville, Central City, Duenweg and other mining camps not now reached by the Southwest Missouri Electric Railway.

THE ST. LOUIS & ST. CHARLES RAILROAD COMPANY has filed articles of incorporation with a change of name and increase of capital at Jefferson City. The capitalization of the new company is $500,000, with J. B. C. Lucas, J. J. Broderick and R. J. Lucas as stockholders. This company is the same as the Wellston, Creve Coeur & St. Charles Railway, which was capitalized for only $2000. It is expected the road will be completed by Jan. 1, 1900.

WILL ATTEND THE STREET RAILWAY CONVENTION.—A representative of the Western Electrical Supply Company will attend the National Street Railway Convention in Chicago, that firm having now a department devoted exclusively to the handling of street railway supplies. Their special catalogue of 126 pages is devoted exclusively to that department. It is carefully compiled and includes everything pertaining to the equipment of a street railroad.

TO SPEND THREE MILLIONS.—The board of directors of the United Railways Company will hold a meeting at once to fix the salaries of the various officials and also of the conductors and motormen. Then, too, action will be taken on changing the Broadway cable to an electric road. An official of the company states that the new line will be in operation before Christmas. He says $3,000,000 will be expended this year in improving the property of the company.

WESTERN ELECTRICAL SUPPLY COMPANY.—This company has recently been given the exclusive western and southwestern agency of Van Dorn & Dutton, Cleveland, for their well known gears, pinions, track cleaners, etc. They report that they have been unusually successful with this line of goods, especially in the southwest. They have also closed up several big telephone deals in the southwest and have also done remarkably well in selling general apparatus in the last 30 days.

MUST HAVE GOOD STREETS.—Julius S. Walsh, president of the St. Louis Terminal Railroad Association, which intended to inaugurate an automobile service between St. Louis and East St. Louis over the bridge, this fall, says that his company are waiting until the manufacturers put something on the market that would meet the demands of such service as the Terminal Company would want. He also says that the city will have to provide good streets before the automobile experiment could be a success in St. Louis, from a rapid transit point of view.

NEW TELEPHONE LINE OPENED.—The new long distance telephone line between St. Louis and Fort Smith, Ark., was opened last Saturday. It was made the occasion for a celebration by the Board of Trade of Fort Smith, and the members called up various business men in St. Louis and had chats with them over the long stretch of wire. Speeches were made at both ends of the wire. This line brings St. Louis and all the leading points in Arkansas in touch and, it is thought, will greatly promote trade and commercial interests between the two states.

THE NATIONAL ASSOCIATION OF STATIONARY ENGINEERS, who have just held their meeting here, have decided to meet next year in Milwaukee. The following officers were chosen for the ensuing year: Herbert E. Stone, president, Cambridge, Mass.; P. E. Leahy, vice-president, New York; George D. Van Tassell, secretary, Chicago; Daniel Delaney, treasurer, Cincinnati; C. C. Elhasser, conductor, California; C. W. Fellows, doorkeeper, Texas, and Frank Eardley, St. Louis, member of the board of trustees of the *National Engineer*, the official organ of the asscciation.

UNITED STATES TELEPHONE MANUFACTURING COMPANY.—P. D. Cable, formerly general manager of the Commercial Electrical Supply Company, has been elected vice-president and general manager of the United States Telephone Manufacturing Company. Mr. Porteus, also of the Commercial Company, where he was secretary and treasurer, is now secretary and treasurer of the United States Company. These two gentlemen are at the same time agents for street railway, electric light and telephone supplies, under the firm name of Cable & Porteus, 815 and 817 Market Street, St. Louis.

CANADIAN NOTES.

Ottawa, Sept. 16, 1899.

MR. WILLIS CHIPMAN, C. E., of Toronto, Ont., will prepare plans at once for the proposed improvements to the waterworks and electric light plants at Kamloops, B. C.

WESTON, ONT.—A by-law will be voted on next month by the ratepayers of the town of Weston, Ont., to raise $7000 by debentures for the purchase of an electric light plant for that town.

THE BERLIN GAS & ELECTRIC LIGHT COMPANY, of Berlin, Ont., is reported to be considering the building of an electric railway to Preston, Ont. Should this step be taken a new power house will be built.

THE CANADIAN ELECTRIC LIGHT COMPANY, of Quebec, will shortly let contracts for power house, hydraulic and electrical machinery and transmission line. T. Pringle & Son, of Montreal, are engineers in charge.

LIVERPOOL, N. S.—The contract for electric light plant for the town of Liverpool, Nova Scotia, has been awarded the Royal Electric Company, of Montreal, for the sum of $8580. The Canadian General Electric Company tendered at $8697, and F. W. Clarke at $8508.

ROYAL ELECTRIC COMPANY.—A meeting of the Royal Electric Company, of Montreal, has been called for the 26th inst., for the purpose of sanctioning the by-law for an increase in the capital stock. It is proposed to increase the stock by $750,000, or at the rate of one share for every two at par. The present capital is $1,500,000 and the proposed increase will bring it up to $2,225,000.

THE MONTREAL STREET RAILWAY COMPANY is preparing for the winter by turning out vestibule cars. Hitherto not only has the motorman suffered from the wintry winds and below zero atmosphere, but the warmth of the car, and, therefore, the comfort of passengers has been affected by the opening at the front of the car. All cars that are being put out for the winter service are completely closed in at the front.

PLANT INSPECTION.—At the regular meeting of the Montreal district Assembly of Knights of Labor a few days ago, considerable discussion took place over the advisability of petitioning the government to appoint experts to examine electrical plants. It was clearly demonstrated during the discussion that accidents resulting in loss of life or limb had taken place through the neglect of the government in not appointing an inspector for this purpose.

GREENWOOD, B. C.—It is said that it is the intention of Mr. W. A. Campbell and John McGregor, representing eastern capitalists, to install an electric light plant at Greenwood, B. C., using the Boundary Falls water power. In connection with the Boundary Falls water power development, at Rossland, B. C., a tunnel is being driven about 130 feet through the solid rock, and from the lower end of this tunnel to the power house there will be a flume 1800 feet in length supported on trestles. It is understood that a power plant will be put in later. Francis McLean, of Greenwood, B. C., has charge of the work.

MAYOR WILSON, of the city of London, Ont., announces that he will call a special meeting of the city council to discuss the street railway situation and push municipal ownership. He asked the city engineer to estimate the cost of an electric street railway paralleling the lines of the present electric street railway, and the engineer has reported that the proposed road and the plant requisite for its operation would cost $500,000. This new project has arisen out of the long strike of the electric street railway employees, which promises to continue to an indefinite length, since all efforts at a compromise have failed.

YUKON TELEGRAPH LINE.—It was expected that the Yukon telegraph line between Skagway and Dawson being completed, construction would have been begun without delay upon the projected line connecting it with the British Columbia telegraph line at Quesnelle, by stringing a wire from the latter point to Telegraph Creek, on the Stikine River, and thence on through the Atlin district to Lake Tagish station, on the Yukon line. It is now known that, for some unexplained reason, the Dominion government has decided to postpone operations. Tenders for the supply of wire for the projected line were recently invited. The time for receiving bids expired on the 24th of August, and quite a number of tenders were put in.

MR. N. PINZE, of Montreal, has invented a new street car fender. It is made of slats of iron or wood fitted on to a frame, which is attached to the front of the car. These slats are concave in shape, but the edge above the track is oblique instead of straight. By an ingenious contrivance the motorman can, when he sees any object upon the track and in danger of collision, drop the fender so that its oblique edge will only be a fraction of an inch from the ground. The outside end of the fender is supplied with small wheels or rollers which rest upon the rails and prevent the fender from forming an obstruction to the forward motion of the car. In addition, this fender is supplied with springs which relieve the shock of the blow inflicted by a body coming in contact with the fender. It is claimed that the oblique edge of the fender, together with the springs, will greatly reduce the danger of shock and will throw the body of a person struck by a car to one side. Arrangements are being made to have the new contrivance tested by the Street Railway Company.

THE OTTAWA ELECTRIC COMPANY has offered to sell out to the city its electric lighting plant and patronage for the sum of $1,241,740. The Deschenes Electric Company has modified its former offer by proposing to supply the city with arc lights for street lighting at the expiration of the present contract with the Ottawa Electric Company, at the rate of $45 per lamp per annum, which means a saving of $20 per light on the present contract. It also offers to supply power for manufacturing purposes to the amount of 2000-hp in lots of 25-hp or upward at the rate of $30 per horse-power to any new manufacturing firm which may locate in Ottawa. The Metropolitan Electric Company, of Ottawa, offers electrical power up to 3000-hp, distributed in amounts of 20 up to 100-hp, at a rate of $25 per horse-power per annum, to encourage new industries to establish themselves at Ottawa. The Metropolitan Company has now 500 men engaged on its works at Britannia and will push the undertaking to a speedy conclusion. The contractors, Messrs. Brewder and McNaughton, have thrown up the contract on the power canal of the company, as they found that they had tendered too low for the work. They will lose $20,000. The company has, therefore, taken up the work itself and will rush it to completion.

SOUTHERN NOTES.

Memphis, Sept. 16, 1899.

THE BROWN ELECTRICAL COMPANY, of Little Rock, Ark., has commenced wiring the Peabody Hotel for 160 telephones, also the "Cordovia" for 40. The "Cordovia" is a new family hotel being erected on the corner of Third and Madison streets, of this city, by Mrs. Napoleon Hill.

THE PEOPLE OF PARIS, TENN., are organizing a company to put in telephones in competition with the Cumberland Company. The mayor of the city is at the head of the list. The people claim that the rates of the Cumberland Company are too high for a city the size of Paris. Your correspondent had a talk with Mr. Foster Hume, local manager of the Cumberland Telephone & Telegraph Company for this city, and learned that it now has 2130 telephones in service. During August it put in 115 and has orders on its books for 74 instruments, to be put in as soon as possible.

MR. A. M. GIBSON has purchased the telephone exchange lately put in at Iuka, Miss., and is working up quite a good business. Mr. Cressup is now managing the La Flore Telephone Company's business at Greenwood, Miss. He has had considerable experience in the telephone business, in building territorial lines in and around Parsons, Miss. He has a line extending from Greenwood to Grenada, Miss., through Parsons. It was stated in "Southern Notes" of last week that the Cumberland Company had purchased the Greenwood Exchange. This was an error. The Cumberland Company has an exchange in that flourishing little city and is offering telephones free of charge in order to drive the old company out.

General News.

THE TELEGRAPH AND TELEPHONE.

DELTA, OHIO.—The Delta Home Telephone Company has been formed; capital stock, $10,000.

DARLINGTON, S. C.—Cheraw, Darlington, Florence, Timmonsville, Sumter and Hartsville are soon to be connected by telephone.

PROVO, UTAH.—The railroad telegraph line between Provo and Heber is now in course of construction. Every effort is being made by the Rio Grande Western to reach Heber City by Oct. 1.

NEWARK, N. Y.—The towns of Lyons, Clyde, Savannah, Lock Berlin, Rose, North Rose and Alloway have recently been connected with the new telephone exchange. In Newark there are 112 subscribers.

OTTERBEIN, IND.—The Otterbein Telephone Company has been formed to operate a telephone line and exchange; capital, $10,000. Incorporators, L. Leanning, I. E. Sovitzer, R. H. Belt, all of Otterbein.

CENTERVILLE, IND.—The Centerville Telephone Company has been formed to operate telephone lines. Capital, $10,000. Incorporators: W. McCrusham, J. E. King, J. E. Burris, F. M. Cluenger, all of Centerville.

FAIRBURY, NEB.—The Fairbury Telephone Company has been formed for the construction and maintaining of a telephone line. Capital, $5000. Incorporators: C. B. Sutton, J. Heasty, A. Lindell, E. C. Hansen, L. W. Goodrich, all of Fairbury.

ALLENTOWN, PA.—The Lehigh Telephone Company has been formed for constructing and maintaining telephone and telegraph lines. Capital, $20,000. Incorporators: T. Dougherty, F. E. Lewis, L. L. Roney, J. Taylor, F. H. Hersh, all of Allentown.

KEYSER, W. VA.—The Union Telephone Exchange has been formed under the laws of West Virginia, with a capital stock of $50,000, to build and operate telephone lines. The incorporators are C. W. Siever, T. B. Frye, G. S. Frederick and J. S. Taylor, all of Keyser.

DETROIT, MICH.—The Wohlgemuth Automatic Telephone Holder Company has been formed for the manufacturing and sale of a patent telephone receiver, etc. Capital, $10,000. Incorporators: M. Wohlgemuth, Martha Wohlgemuth, B. Jacobson, all of Detroit.

ORTONVILLE, MINN.—Amendments have been filed of the articles of incorporation of the Interstate Telephone Company, which has a capital stock of $12,000, and which will do business in the city of Ortonville, the counties of Big Stone and Lac qui Parle, and in North Dakota.

CHICAGO, ILL.—The Chicago Telephone Company has completed its New Lenox extension. A station has been placed there and connections will be made to the surrounding district. It is proposed to continue the line to Blue Island, where the Chicago connection will be made.

TRENTON, N. J.—The International Telephone & Switchboard Company, with an authorized capital of $1,000,000, has filed papers of incorporation. The company is to make telephones and switchboards. The corporators are L. B. Grant, Thomas S. White, New York, and J. C. Pope, Plainfield, N. J.

KANSAS CITY, MO.—The Kansas City Mutual Telephone Company has been formed to operate telephone exchanges, etc.; capital, $500,000. Incorporators, B. F. Burd, J. L. Lombard, F. H. Turner, F. W. McMillan, G. V. Ross, W. H. Alley, W. C. Allen, C. S. Palmer, A. M. Allen, all of Kansas City.

SCRANTON, PA.—The Scranton & Stroudsburg Telephone Company has been formed for constructing and maintaining telephone and telegraph lines. Capital, $100,000. Incorporators: M. J. Martin, of Scranton; E. D. Dunning, of South Sterling; T. M. Lynch, of Tobyhanna; O. E. Vaughan, of Moscow; U. V. Schoonmaker, of Elmhurst.

KANSAS CITY, MO.—A receiver for the Standard Telephone Company has been petitioned for by J. L. Huff, a stockholder. The petition states that the company was organized in 1896 with 3000 shares at $100 a share, but at the time of incorporation only seven of these shares were subscribed for, but not paid for. The directors traded the stock to companies they organized and then traded the stock back to themselves until the directors owned twenty-nine-thirtieths of all the shares and then planned to sell out to the Missouri & Kansas Telephone Company.

ST. LOUIS, MO.—Hopkins J. Hanford, general manager of the Kinloch Telephone Company, has been arranging maps and profiles for a new long distance telephone enterprise which will cover all important points in the Mississippi Valley. Mr. Hanford says: "The proposed company will be incorporated Oct. 1, with a capital stock of $1,000,000 paid up. It will be known as the Kinloch Long Distance Telephone Company, and will extend many miles to the north, east, south and west of St. Louis. The company is the outgrowth of the Kinloch Telephone Company, of St. Louis, which organization has recently made a large extension in its local service, involving an additional expenditure of $212,000 on its switchboard facilities."

ELECTRIC OPERATOR NOT A PUBLIC OFFICER.—The Police Board of the city of Rochester by a resolution adopted at a time when there was no statute creating or authorizing the creation of such an office, gave Louis W. Miller, an electrical operator of the city's police telegraph system, the title "Superintendent" of that system. Miller, in an action begun last February against George E. Warner and James D. Casey, individually and as such Police Commissioners, procured an injunction restraining the defendants from interfering with him in the performance of his duties as superintendent and from removing him. The Fourth Appellate Division, by Justice Follett, has reversed an order of the Monroe Special Term, denying a motion to vacate such injunction, holding that plaintiff was not a public officer, but a mere employee of the city, and could not maintain an equitable action to restrain the commissioners from discharging him before the expiration of his term of service.

THE ELECTRIC RAILWAY.

ERIE CANAL.—The Erie Canal Electric Traction Company, of New York City, has been filed under the laws of Delaware, with a capital stock of $5,000,000.

SARATOGA, N. Y.—The Saratoga Traction Company, of Saratoga, N. Y., have placed the order for their new viaduct with the Berlin Iron Bridge Company, of East Berlin, Conn.

CHARLESTOWN, W. VA.—The street railway of this city, which has been in the hands of a receiver, and for several years of uncertain ownership, has been purchased by Russell A. Brown, of Cleveland, Ohio.

LAGRANGE, IND.—The town trustees have granted a franchise to the Northeastern Indiana Street Railway Company to construct and operate an electric line from Goshen to Lagrange, the line to be constructed within two years.

FORT WAYNE, IND.—The Wayne Construction Company has been formed to manufacture, operate and install electric railways, waterworks, electric plants, etc. Capital, $5000. Incorporators, J. C. Knight, H. C. Knight, A. M. Rockwell, all of Fort Wayne.

MT. VERNON, N. Y.—The Westchester Electric Railroad Company, a street surface railroad corporation, has declared its intention to make extensions from the city of Mount Vernon to the village of Bronxville, and also extensions to various other points.

BUFFALO, N. Y.—The Buffalo Traction Company has filed plans for a new power house at Walden Avenue and the Belt Line crossing. The building will be 92½ by 183 feet dimensions, one-story high, and will cost $6800. The construction will be of brick throughout.

GALVESTON, OHIO.—The property of the Galveston City Railroad Company has been sold by order of the United States Court in foreclosure proceedings to satisfy a bonded indebtedness of $1,250,000. It was purchased by Julius Runge, president of the company, the price being $905,000.

THE ELMIRA & SENECA LAKE RAILWAY COMPANY are pushing the construction of their line. The American Engineering Company, of Philadelphia, Pa., are the general contractors for the road, and have placed the order for the seventeen bridges required with the Berlin Iron Bridge Company, of East Berlin, Conn.

COLUMBUS, OHIO.—The Cincinnati & Eastern Electric Railway Company has been incorporated by Henry L. Korte, Henry W. Backus, Edward W. Boston, Edwin J. Howard and Charles E. Smith; capital stock, $10,000. They propose to build a line from Cincinnati to New Richmond, running through Hamilton and Clermont counties.

HOMEVILLE, PA.—The Monongahela Street Railway Company will extend its Munhall branch from Homeville through Whitaker and down over the hill to connect with the Braddock and Duquesne lines at the Braddock bridge, thus completing a loop. The additions will traverse the proposed new township road which the property holders of the vicinity have petitioned court to open.

HEMPSTEAD, L. I.—The State Board of Railroad Commissioners has granted the application of the Mineola, Hempstead & Freeport Traction Company for the usual certificate to construct its road which is to be an electric one. The application was opposed by the Long Island and the Flushing & South Shore Railroad companies and the Nassau Belt Line Traction Company.

READING, PA.—The Kutztown & Reading Railway Company has been chartered to build a line from Kutztown to Reading; capital stock, $150,000; directors, Henry J. Schmick, of Hamburg; John M. Kutz, Mahanoy City; Solomon K. Hoffman, Hamburg; Samuel C. Boyer, Port Clinton; Dr. J. S. Trexler, Kutztown; P. L. Diener, Frank R. Wagner and Alex. Murdock, Hamburg.

ALTOONA, PA.—The Altoona City Passenger and Logan Valley Electric Railway companies and the Altoona Gas Company have been sold by John Lloyd, president of the three companies, to Turner A. Beal, of New York City, representing a Philadelphia and New York syndicate. The electric railway stock brought $62.50, par value $50, and the gas stock $38.33, par value $20. The deal involves a million dollars.

DENVER, COLO.—Two bills for ordinances permitting the Denver City Tramway Company to electrify its cable tracks, and make other material changes in its lines have been introduced at a meeting of the Board of Aldermen. One bill provides that a single fare shall be charged for each bicycle carried; that a half rate shall be charged for children between the ages of 6 and 12 years, and that 10 half fare tickets shall be sold for 25 cents.

MADISON, MINN.—A syndicate represented by Henry C. Payne, of Milwaukee, and owning the street car lines in that and other cities of the northwest, has about concluded negotiations for the purchase of the Madison Electric Company, which is nine miles in length and considered one of the best roads in the state. The price will be $225,000, the syndicate buying the $75,000 stock of the company and assuming the bonds, amounting to $150,000.

CLEVELAND STRIKE GOING TO PIECES.—Twenty-five of the old employees of the Big Consolidated Street Railroad Company went to work on Sept. 16, making in all about 150 who have returned. A meeting of the employees was held on the 17th to have the strike declared off. The call was issued by the Strikers' Executive Committee at the request of a large number of the men who lost all hope of carrying the fight to a successful conclusion.

NEW ROAD TO FORT SHERIDAN.—A short electric railroad is projected to connect the Chicago, Milwaukee & St. Paul line with Fort Sheridan. It is to run from Roundout east to Highwood. The government freight business at the military post is at present monopolized by the Chicago & Northwestern road. The new branch will probably be able to reach the fort through the Chicago & Milwaukee Electric Railroad, which has a line running by the government property.

BIRMINGHAM, ALA.—The Birmingham Railway & Electric Company has bought the Birmingham Traction Company's lines, and is the owner and will be

the operator of all the street car lines in the city of Birmingham. The Traction Company, which was controlled by William Halls, Jr., and E. E. Whittaker, of New York, owned a four-mile electric line to North Birmingham and a seven-mile electric line to Gate City, besides the Highland Avenue steam dummy line, seven miles long, recently acquired from Mr. Whittaker. The consideration was in the neighborhood of $1,000,000, of which $500,000 is represented in a bond issue on the Traction Company's lines. The Railway & Electric Company officials will remain at the head of the consolidation and will direct its affairs, commencing by making the Highland dummy division an electric line. The company is now the owner of 125 miles of street railway extending from Birmingham to its suburbs in every direction, and controls a system second in value to none south of Baltimore. A. M. Shook is president, Robert Jemison vice-president and J. B. McClary general manager.

ELECTRIC LIGHT AND POWER.

HOWARD CITY, MICH.—The electric light plant has been totally destroyed by fire; loss, $5000.

KNOXVILLE, PA.—The Knoxville Electric Company has been formed by J. P. Moore and W. Adams. Capital, $1000.

DUBUQUE, IOWA.—The Home Electric Company has filed articles of incorporation at Dubuque, with a capital of $100,000.

MILWAUKEE, WIS.—The Johnson Electric Service Company has been formed; capital, $300,000; capital in Illinois, $4000.

RICHMOND, TEX.—The Richmond Electric Company has been formed, capital $4000, by C. A. Beasly, A. A. Bailey, R. F. Ransom. Its plant is already built.

VINCENNES, IND.—The Vincennes Electric Lighting Company has been formed to construct and operate an electric light plant; capital, $75,000. Incorporators, J. H. Brown, G. Mayer, P. O. Mayer.

ST. PAUL, MINN.—The American Electric Company, of St. Paul, capital $25,000, has been formed for the manufacture and installation of apparatus, by C. D. Crandall, George S. Elliott and A. M. Little.

CHICAGO, ILL.—The Guarantee Electric Company has been formed for manufacturing electrical appliances and supplies; capital, $50,000. Incorporators, R. S. Wait, H. W. Hawkins, C. L. Hawley, all of Chicago.

FREDERICKSBURG, VA.—It is stated that an upset bid of 10 per cent. has been made for the plant of the Rappahannock Electric Light & Power Company, of this city, and that the property will again be sold at auction.

DARLINGTON, WIS.—For a consideration of $27,000, Frank S. Walker has sold out the controlling interest in the Darlington Electric Light & Water Power Company, located at Darlington, this state. The company has been reorganized.

ENGLISH, IND.—The English Light & Manufacturing Company has failed, and some ten or a dozen important interests in southern Indiana are involved, with the probable loss of more than $100,000 to the company. W. L. Luckett and J. R. Duffin have been appointed assignees.

SANDY HILL, N. Y.—The United Gas, Electric Light & Fuel Company of Sandy Hill and Fort Edward, has been formed; capital, $150,000. Directors: James E. Flood, James D. Sherrill, Sandy Hilll; John L. Wentz, Scranton, Pa.; William C. Hendrickson, Belle Meade, N. J.

LA CROSSE, WIS.—The town of Melrose, Jackson County, Wisconsin, has voted $10,000 in bonds in aid of the construction of the La Crosse & Black River Falls & Neillsville Electric Railroad, to be built at once from this city to Neillsville, making the longest electric freight and passenger railroad in the west.

MATANZAS, CUBA.—The Matanzas Waterworks Company, which is backed by New York capital, has been incorporated at Dover, Del., with a capital of $600,000. The company proposes to provide the city of Matanzas, Cuba, with water, ice and electric lights. Its charter gives it the privilege to operate in other Cuban and in Puerto Rican towns.

SANTA ANA, CAL.—The Edison Electric Company, with a few moneyed men of Orange County, will soon absorb the Santa Ana Gas & Electric Company. It is the intention of the new company to run a heavy line from above Whittier, tapping the Southern California's system to Santa Ana, putting in there a large substation, and then constructing a branch line to Orange, and possibly a line to Tustin. In all probability a substation will be put in at Fullerton and at Whittier, so that those towns may be lighted.

TRAFFIC IN OPTIONS.—C. H. Clouser, a capitalist, of York, is making an effort to obtain an option on the stock of the Shamokin Electric, Edison Electric Illuminating and the Shamokin Gas companies. He represents a syndicate securing options on numerous light companies throughout the state. These options are subsequently sold to a large syndicate backed by New York and Philadelphia capital. Clouser said he would give stock in the new company, in addition to a bonus, in exchange for directors' shares. This offer was accepted by a majority, but a minority large enough to block the consummation of the deal is holding out for a better offer.

THE AUTOMOBILE.

PHILADELPHIA, PA.—The Lewis Motor Vehicle Manufacturing Company has been formed for manufacturing iron and steel and motor vehicles; Capital, $50,000. Incorporators, H. H. Simpers, L. Pyott, D. C. Clarke, J. W. Graham, all of Philadelphia.

SPRINGFIELD, OHIO.—Ed. S. Kelly, who made a fortune on his rubber tire deal, will start a large factory here to manufacture automobiles. An improved machine is being constructed at the Kelly Roller Bearing Company's plant, which, it is claimed, will be far in advance of present automobiles.

PHILADELPHIA, PA.—A charter has now been granted to the Lewis Motor Vehicle Company, of Philadelphia, the second automobile company to receive a charter in the state. The capital stock is $50,000, and the directors are Harry H. Simpers, Lewis P. Gatt, Daniel C. Clark, John W. Graham, Henry C. Chapman, of Philadelphia.

INDIANAPOLIS, IND.—The rapid increase in the number of automobiles in use in this city has brought out inquiry as to whether such vehicles are covered by the vehicle ordinance. Comptroller Johnson points out that the ordinance was amended last winter so as to include automobiles, and provides that the license fee for such a vehicle shall be $3 a year.

MILWAUKEE, WIS.—The Charles Abrosch Carriage Company, one of the largest manufacturers in the northwest, is preparing to go into the automobile business. A company, with a capital of $5,000,000, is being formed, and all kinds of automobiles will be manufactured. The plan is to erect plants in Milwaukee, Chicago, St. Louis, Detroit and New York for the manufacture of automobiles.

NEW COMPANIES.

MASTER RECORD COMPANY, of New York City, has been filed under the laws of Delaware, to make and deal in records for phonograph, etc., with a capital stock of $133,000.

THE CHICAGO MOTOR & DYNAMO COMPANY has been formed; capital stock, $2500; incorporators, Walter Simpson, E. J. Saltzmann and Edward Menkin.

CHICAGO, ILL.—The Continental Electric Telephone Company has been formed for the purpose of manufacturing telephone and electrical apparatus; capital, $50,000. Incorporators, G. F. Stitet, T. Lidberg, A. I. Coyne, all of Chicago.

M'DOUGALL STORAGE BATTERY COMPANY has been formed in New York City, with a capital stock of $1,000,000, by M. E. Waldstein, of South Orange, N. J.; J. O. Elwell, E. Conway, L. G. Roch and R. H. McGrath, Jr., of New York City. The company is formed under the laws of West Virginia.

CHARLESTON, S. C.—A commission for a charter has been issued to the Charleston Electrical Construction Company. The capital stock of the company is to be $7500. The corporators of the company are: Charles F. Middleton, J. Lamb Perry, Wm. H. Jones, John E. Torbert and George E. Hazelhurst. The company will go into the general construction business.

OBITUARY.

MR. W. W. DODGE.—The death is announced of Mr. W. W. Dodge, treasurer of the Dodge Manufacturing Company, Mishawaka, Ind., on Friday, Sept. 1, only 39 years of age. He had been identified with the concern ever since its organization and was a large contributor to its success and prosperity.

JACOB FREDERICK SCHOELLKOPF, president of the Niagara Falls Hydraulic Power & Manufacturing Company, died suddenly at his home on Delaware Avenue, Buffalo, about midnight Friday last from a complication of troubles. He was born in Kirchheim-unter Teck, Germany, November 15, 1819, and at 22 years of age came to America, landing in New York without the slightest knowledge of English. He remained in New York for two years working at his trade of tanner, and then moved to Buffalo. There he opened a small leather store and later established a tannery. His operations in this line extended to Milwaukee, Chicago and Sheffield, Pa. His business enterprises were remarkably successful, and later he became interested in flouring mills in Buffalo and Niagara Falls. At one time he had extensive railroad interests, and was among the promoters of the Niagara Falls & Suspension Bridge Railway. With others he purchased the hydraulic canal at Niagara Falls in 1877, and ever since his capital and energy have been devoted to the improvement of the property. The extent of this improvement is well known to all who have watched the power progress at Niagara Falls for the past few years. He was interested in many other companies, among them the Cliff Paper Company of Niagara Falls, and the Citizens' Gas Company of Buffalo, of bot hof which he was president. He is survived by a wife, five sons and one daughter.

EDUCATIONAL.

THE ELECTRICAL ENGINEER INSTITUTE.—We are in receipt of the new catalogue of The Electrical Engineer Institute of Correspondence Instruction of New York, and the fact that a third edition has been called for in a short time speaks favorably of the interest which is being taken in the work of the Institute. The courses are given in complete synopsis, and include all branches of electrical engineering, including electric lighting, electric railways, electric mining, telephony, telegraphy, mechanical engineering, mechanical drawing, etc. A glance at the names of the authors of the various sets of instruction papers brings to light a strong feature of the Institute's work, which lies in the fact that all the instruction papers have been prepared by recognized specialists and authorities in their respective fields. We also note in the new edition many letters from students of the Institute, both at home and abroad, who express their great satisfaction at the benefits that the studies have conferred upon them. The success with which the Institute is meeting is no doubt due to the high standard which it has taken in the preparation of its instruction papers and the conscientious manner in which it deals with its students. The Institute's catalogue will be sent free to anyone on application by addressing the main office, 120-122 Liberty Street, New York.

LEGAL.

SERIES-PARALLEL CONTROLLER INJUNCTION.—A preliminary injunction was issued Sept. 1 from the United States Circuit Court for the Southern District of Michigan, in the case of the Thomson-Houston Electric Company vs. the Detroit Citizens' Street Railway Company, enjoining the latter from using a controller claimed to infringe a patent (No. 393,323) granted to George Herbert Condict Nov. 20, 1888. The claims of the patent which are alleged to be infringed are Nos. 20, 21, 22, 27, 28, 29, 31, and relate to a combination of two motors with a switch coupling the motors in series or multiple to vary the internal resistance, a switch to insert a resistance when the motor switch is being shifted, and a connection between the switches to operate both simultaneously.

DAMAGES FOR CUTTING WIRES.—The Electrical Power Company's suit, begun nearly ten years ago against the city of New York, the Commissioner of Public Works, and the Board of Electrical Control, to compel the restoration of its electric wires and appurtenances, which had then been removed, and $250,000 damages, for the destruction of its electrical service in this city, was decided last week by Justice Russell in the New York Supreme Court, Special Term. The court holds that the Commissioner of Public Works was justified in cutting the plaintiff's wires, but, on the theory of conversion, gives judgment against the city for $6000, as the value of the wires, with interest from the time of conversion. The wholesale wire cutting of Mayor Grant's régime, to which this episode belongs, will long be remembered in the electrical circles of New York.

DECISION ON A SWITCH.—Judge Townsend, of the United States Circuit Court, dismissed the complaint in the case of the Cutler Electrical & Manufacturing Company against the Anchor Electric Company and Stanley & Patterson. The final hearing raised the question of validity and infringement of patent No. 637,667, issued Sept. 30, 1890, to complaints' assignors, Henry B. Cutler and Lucius T. Stanley, for an electrical switch. Judge Townsend said in part: "And now that several days have been wasted in the argument of this case and in an exhaustive examination of the various patents, it is only fair to state that no reason for bringing this suit has been shown. There seems to be an increasing tendency on the part of counsel for patentees who have been defeated at final hearing in one circuit to try to secure rehearing on the same questions in another circuit upon various frivolous excuses. The writer has thus been called upon, in four cases during one month, to listen to extended explanations of mechanical combinations, and to long arguments on questions of law at final hearing, only to reach the conclusion, after patient, independent investigation, that his views in these cases were in accord with those of the court which had already fully examined said questions and stated its opinion therein. Let the bill be dismissed."

PERSONAL.

MR. JOHN W. LIEB, JR., who has just been elected president of the Edison Association of Illuminating Companies, is an M. E. graduate of the Stevens' Institute of Technology. He began as a draughtsman in the old Brush works at Cleveland, and joined the Edison forces in 1881, becoming the first electrician of the first Edison station in New York City. In 1882-3 he went to Milan, Italy, to organize the Edison station there, but in 1894 he was recalled to the United States to become assistant general manager of the New York Edison Company. This year in the consolidation of lighting interests in this city, he has become associate general manager of the colossal New York Gas & Electric Light, Heat & Power Company.

Mr. Lieb was president of the New York Electrical Society in 1895-6, and has served as an officer of the American Institute of Electrical Engineers. He is also a member of the American Society of Mechanical Engineers and of the Italian Society of Electricians. He is not only a leading engineer, but an accomplished linguist and a most popular man in his profession and in society. His portrait has already been published in these pages and in *The Electrical Engineer* of June 26, 1895.

PRESIDENT JOHN I. SABIN, of the Pacific Coast Telephone Company, and President Charles J. Glidden, of the Erie Company, will sail for Europe this week on an errand to study the telephone systems of England, France, Germany and Sweden.

MR. J. F. McELROY, the electrical engineer of the Consolidated Car Heating Company, of Albany, who is already well known as an inventor, is credited with devising a new car axle lighting system, which has been put on trial on the Delaware & Hudson.

MR. A. E. WINCHESTER, who, as electric light commissioner, has been doing excellent work with the municipal plant at South Norwalk, is mentioned as superintendent of the local division of the Connecticut Lighting & Power Company, with a salary of $3600 a year for five years. If the local plant were sold at a good figure, Mr. Winchester might possibly consider the offer.

MR. G. MARCONI is expected to reach New York Wednesday, Sept. 20, aboard the Cunard Line steamship Aurania. He wil bring three assistants with him, besides his own apparatus and entire paraphernalia to be used in his experiments on this side of the water. After his tests during the international yacht race, he will conduct a series of experiments under the supervision of officers of the Signal Corps of the United States army. These will be arranged by Colonel Allen, head of the Signal Service Bureau at Washington. It is said that the Italian inventor will remain in this country at least three months. Capt. G. O. Squier, U. S. A., meets him on arrival.

DR. W. D. EASTLAKE, an American who resides in Japan and is now visiting in New York, said the other day, in speaking of the opening of Japan commercially to the rest of the world on Aug. 4, that it means the abolishing of consular courts and jurisdiction and the treaty limits. Foreigners will have the right to hold land. Export duties will be abolished and import duties reduced. Representatives of English syndicates are busy on the spot, but the Japanese prefer to do business with Americans. This preference is natural, for Americans have done a great deal for Japan. Dr. Eastlake will be glad to receive catalogues, etc., and discuss Japanese trade with anyone desiring to reach the new market. He can be addressed care of Electrical World and Engineer.

MR. T. A. EDISON, with some associates, has bought the Oritz mining grant in the southern part of Santa Fe County, about 25 miles from Santa Fe, N. M., for a consideration of about $3,000,000 after much trouble and controversy. It is the intention of Mr. Edison and those associated with him to build a large reduction plant, where he will treat gold ore by a new electric process. This grant was confirmed by Congress on March 1, 1861, for 69,000 acres. Of the original grant about 15,000 acres were sold to the Cerrillos Coal & Iron Company, leaving 54,000 acres, of which the New Mexico Mining Company gained possession. Stephen H. Elkins was appointed receiver of the grant on May 15, 1896. Mr. Elkins turned the property over to S. G. Burn, who took charge in the interest of Mr. Edison.

Trade and Industrial Notes.

THE AMERICAN THREAD COMPANY, of Holyoke, Mass., have placed the order for their new boiler house with the Berlin Iron Bridge Company, of East Berlin, Conn.

SMITH INTERCHANGEABLE TELEPHONE COMPANY, of 1304 Chamber of Commerce Building, Chicago, report considerable inquiry from suburban railroad contractors in addition to the other fields they cover already.

THE UNITED ELECTRICAL HEATING COMPANY has recently placed upon the market a new air heater or radiator suitable for heating small rooms, offices, etc. The heater is efficient and very attractive in appearance. Circular No. 22 describes this heater in detail.

EDISON SOCKETS AND RECEPTACLES.—In a neat pamphlet, entitled "Sockets and Receptacles for Lamps with Edison Screw Bases," the General Electric Company lists no less than 70 different types of sockets, receptacles and accessories, of which 49 are illustrated by cuts.

THE CENTRAL ELECTRIC COMPANY report a Chicago festival of their own. This is not to be understood as competing with the great event in October, but is a joyous aggregation of good orders from plenty of pleased customers for electrical staples of a generous line.

J. B. COLT & COMPANY, 3, 5 and 7 West Twenty-ninth Street, New York City, pioneers in the development of acetylene gas generators, have just issued a circular calling special attention to two new models of their Criterion type of apparatus. The price of both is very low, and they will prove useful in many localities and for many purposes.

THE ELECTRIC APPLIANCE COMPANY, Chicago, report the largest business in the history of the company. The increase is not confined to any particular line, but is evenly distributed through their arc and incandescent department, street railway, telephone and telegraph supplies, house goods and in fact is shown in everything electrical.

PLASTIC PASTE FLUX.—Last week in our Trade Notes reference was made to the broad patent claims of the Burnley Battery & Manufacturing Company, Painesville, O., on plastic paste flux. Mr. Wm. Burnley, manager, writes us that the patent is not limited to the kind or quality of the grease or flux used, but that it protects broadly any such combination that is plastic.

THE AMERICAN DISTRICT STEAM COMPANY, of Lockport, N. Y., are just completing a very successful season in the installation of their underground steam heating by the exhaust steam from central lighting and railway stations. Some of the plants installed this year are extensions on past work, proving conclusively the success of utilizing exhaust steam in this manner. Among the new installations are Wilkinsburg, Pa., Pawtucket, R. I., Sedalia, Mo., Crookston, Minn., and Marinette, Wis.

STURTEVANT PLANING MILL EXHAUSTERS.—A large octavo catalogue of 40 pages is devoted exclusively to the description of steel plate planing mill exhausters, made by the B. F. Sturtevant Co., of Boston. Among the many types shown are two that are electrically driven. One of these has a four-pole motor, and the other is a specially patented design in which the motor is entirely enclosed in a cast iron casing, while the fan is so attached to the end of this casing that it may be swung around to discharge in any direction.

CHICAGO RHEOSTAT COMPANY.—Notice has already been given of the removal of the Chicago Rheostat Company from Chicago to New York. Branch offices with a large and well assorted stock of rheostats will be maintained at 1012-1013 Monadnock Block, Chicago, to accommodate a well developed Western business, but the factory and main office will be in New York, in charge of Mr. E. W. Hammer, at 397 to 407 East 33d Street. While the growth of this company has shown a splendid increase, it is believed that the domestic business can be handled as well from New York with a decided advantage in the handling of foreign trade. Other offices of the company can be found on reference to our advertising pages.

WESTERN ELECTRICAL SUPPLY COMPANY, of St. Louis, report that their summer and fall business has been unprecedented. They say that the good times are not confined to any one section of the country, but seem universal. Their policy has always been a broad and liberal one, based on judicious advertising, liberal treatment of their customers, and prompt shipments from stock, so that to-day they are one of the largest electrical supply houses in the country. They are exclusive territorial sales agents for the Eddy & Warren apparatus, and have recently closed a number of very good deals with this apparatus in the Southwest. They have given especial attention to the independent telephone movement, and report their telephone department as being crowded with orders. Their new 1900 telephone, which they are sending out on trial, subject to return at their expense if not satisfactory, is meeting, they report, with great success. They carry a complete stock of everything pertaining to the equipment of telephone exchanges and lines.

LOMBARD WATER-WHEEL GOVERNOR.—The Lombard Water-Wheel Governor Company, 61 Hampshire Street, Boston, has issued a pamphlet describing its new type F governor, which has been designed for application to Pelton and other makes of impulse water-wheels, and for the regulation of small turbines. A concise general description of the new governor is given, and also clear instructions as to data to be furnished to the manufacturers when ordering. A letter is printed from the superintendent of the celebrated Redlands plant in California, which speaks in the highest terms of the performance of the Lombard governor in that plant.

OVER FIVE THOUSAND LETTER CARRIERS visited Scranton, Pa., on Labor Day and took part in a parade which preceded the business sessions of the tenth annual convention of the National Association of Letter Carriers. In honor of the occasion the business houses of the city were handsomely decorated and electrical devices were freely used. The International Correspondence Schools had a large monogram, I. C. S., with letters composed of red, white and blue incandescent lamps in front of their building, making a very fine display. This institution has over a hundred thousand students, and as its mail is handled by carriers in all parts of the country, they were much interested in inspecting the home office at Scranton. A constant stream of visitors went through the building and one evening an informal reception was given the letter carriers. Hundreds of them visited the building and saw how the work of the largest school in the world is conducted. The instructors, textbook writers, correspondents, bookkeepers and other employees were at their desks, and the printing department was also in operation. Over five hundred people are employed in the building, which is one of the finest in the city, having been erected especially for the International Correspondence Schools at a cost of $250,000.

Record of Electrical Patents.

UNITED STATES PATENTS, ISSUED SEPT. 12, 1899.

[In Charge of Wm. A. Rosenbaum, 177 Times Building, New York.]

632,695. INSULATION FOR LEADING IN WIRES FOR SIGNAL BOXES; G. W. Butler, Blumington, Ill. App. filed Jan. 30, 1899. The wires pass through a tube, being bent back over the edge of the tube and covered by a cap which fits over the bent portion of the wires.

632,707. ELECTRIC ARC LAMP; T. M. Foote, Chicago, Ill. App. filed June 15, 1896. Details of a clock-feed mechanism.

632,709. TELEPHONE SYSTEM; S. B. Fowler, Tarrytown, N. Y. App filed Aug. 25, 1898. This invention relates to telephone systems of that class in which the battery is centralized at the exchange; the arrangement of the battery and circuits is such that the battery current flows over only one side of the main metallic circuit and over an independent return circuit.

632,733. INSULATOR FOR TROLLEY WIRE SUPPORTS; F. W. Meaker, Waukegan, Ill. App. filed Sept. 11, 1896. The improvements consist in means for shedding the water at a point remote from the bolt; a shell for supporting the bolt, means for locking the cap on the shell and various minor improvements.

632,739. ELECTRIC METER; Eustace Oxley, Lynn, Mass. App. filed July 27, 1899. (See Current News and Notes.)

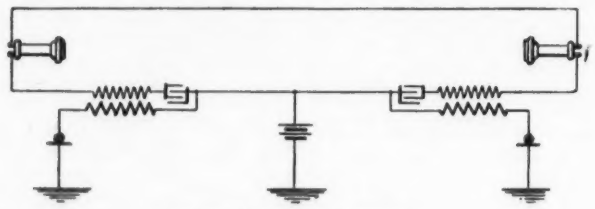
632,749. TELEPHONE SWITCHBOARD; F. M. Richter, Chemnitz, Germany. App. filed Nov. 21, 1898. This is a peculiarly constructed plug arranged to co-operate with the annunciator flap in such a manner that the latter is raised or returned to its normal position when the plug is inserted or removed from the socket.

632,759. TELEPHONE SYSTEM; J. C. Slater, St. Louis, Mo. App. filed May 23, 1898. Details of the circuits and apparatus of an automatic exchange system.

632,772. TROLLEY; R. White, Toledo, Ohio. App. filed March 25, 1899. Oppositely placed arched lips are arranged over the wheel, of such construction as to readily admit the wire to the wheel but preventing its easy removal therefrom.

632,805. AUTOMOBILE; William R. C. Corson, Hartford, Conn. App. filed July 3, 1899. (See Current News and Notes.)

632,849. TROLLEY WHEEL; E. M. Putnam and W. Sellers, Haverhill, Mass. App. filed March 25, 1899. The invention consists principally of a wheel having a central hole countersunk at each end and formed with a series of dovetail recesses into which graphite or other suitable lubricating material is inserted, also an annular recess in the centre of the wheel for lubricating material.



623,709.—Telephone System.

632,851. BEDSTEAD INSULATOR; William Sellers, Haverhill, Mass. App. filed June 26, 1899. Consists of a glass insulator with a wooden pin, the latter to be held in the leg of the bedstead, the weight of the bedstead resting on the top of insulator.

632,868. ELECTRIC LOCK; J. R. Francis, Monroe, W. Va. App. filed June 11, 1898. Details of construction for controlling a lock from a distance.

632,873. VOLTAIC BATTERY CELL; Henri de Rufz de Lavison, Neuilly, France. App. filed Aug. 12, 1898. (See Current News and Notes.)

632,874. CONTROLLING OF ELECTRIC MOTOR-VEHICLES; Henry Leitner, London, England. App. filed Sept. 27, 1898. (See Current News and Notes.)

632,896. COMBINED ENGINE AND DYNAMO; C. C. Cowan, Memphis, Tenn. App. filed Sept. 14, 1898. The engine is bolted to the field magnet and the latter contains a guide for the engine cross-head.

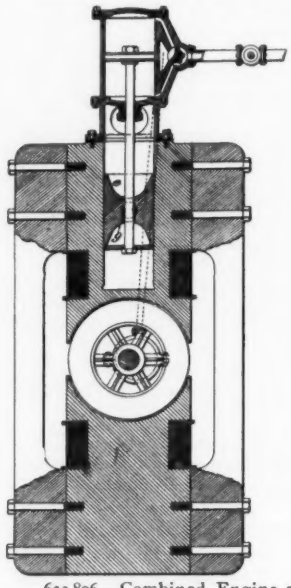
632,897. COMBINED ENGINE AND DYNAMO ELECTRIC MACHINE; C. C. Cowan, Memphis, Tenn. App. filed March 18, 1899. A pair of power cylinders are movably mounted on the dynamo and a piston rod common to both is arranged to drive a crank on the shaft.

632,964. ELECTRIC CLOCK SYSTEM; H. M. Dumas, Detroit, Mich. App filed April 29, 1898. The operating arm for sending in a signal will be arrested by a lock unless the circuit is in good order. If the circuit is in good order the first movement of the arm causes a magnet to release the lock and allows the arm to move.

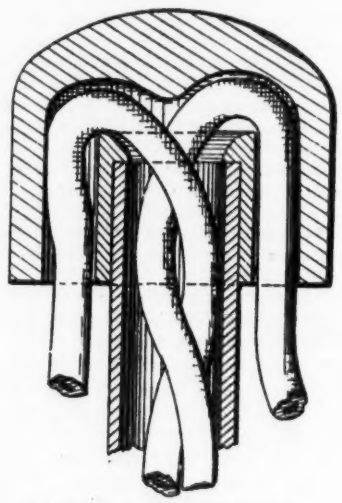
632,970. ELECTRIC INDICATOR; Frederick B. Pope, Augusta, Ga. App. filed May 15, 1899. A number of electromagnets are disposed concentrically about a dial; the magnetic circuit is rectangular in shape, the coil being on one of the long sides and a break in the circuit between the other long side and one of the short vertical sides. A needle is pivoted concentrically with the magnets and has affixed to it a piece of soft iron which passes over the part of the magnet frame where the magnetic circuit is broken. Upon closing and opening in succession the circuits of the electromagnets, the pointer will move over the scale of the dial.

632,973. CONDUIT FOR ELECTRIC CIRCUITS; M. O. Spring, Philadelphia, Pa. App. filed Dec. 9, 1898. The conduit is made so as to serve the purpose of a curb along the street; its principal feature of construction is that the hooks for the cables are cast or attached to the castings of which the conduit is made.

632,980. ELECTRIC RAILWAY SWITCH; C. E. Young, Akron, Ohio. App. filed May 12, 1898. A trolley wire switch comprising a switch plate having guide flanges for directing the movement of the trolley wheel, and a raised track sloping from the ends of the plate toward the centre thereof and adapted to depress the trolley wheel when striking it, a main trolley wire terminal at one end of the switch plate, a plurality of converging trolley wire terminals at the other end of the plate, and a switch tongue normally connecting the main terminal through one of the branch terminals.



632,896.—Combined Engine and Dynamo.



632,695.—Signal Box Insulation.

633,039. DETACHABLE CONNECTION FOR ELECTRICAL FIXTURES; S. R. Reade, Bridgeport, Conn. App. filed May 13, 1899. One part of the connection is provided with two parallel grooves partially covered over; the other part is provided with L-shaped lugs which slide into the grooves and are held in place by the covers.

633,060. ELECTRODE; Marcel Wuillot, Brussels, Belgium. App. filed Feb. 21, 1894. (See Current News and Notes.)

633,067. CLIP FOR DRAWING CONDUCTORS THROUGH CONDUITS; J. G. Brien, London, England. App. filed March 27, 1899. The clip comprises segmental wedges roughened interiorly to take hold of the cable and conical exteriorly, a sleeve embraces the wedges and the means for attaching the hauling cord is attached to the sleeve.

633,075. AUTOMATIC DEVICE FOR OPERATING ELECTRIC SWITCHES; I. Deutsch, Baltimore, Md. App. filed Nov. 2, 1898. The vibrating hammer of an alarm clock is arranged to strike and release a latch controlling a switch lever.

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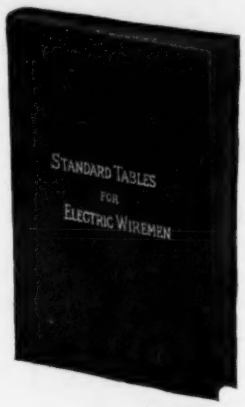

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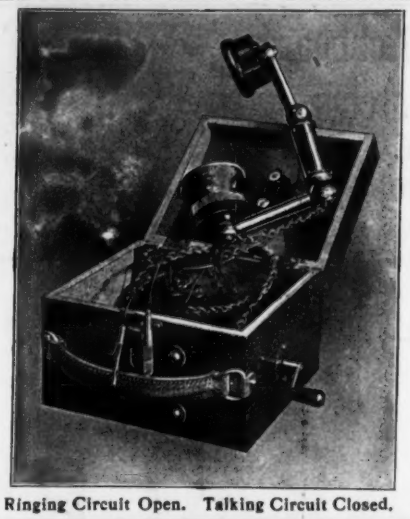

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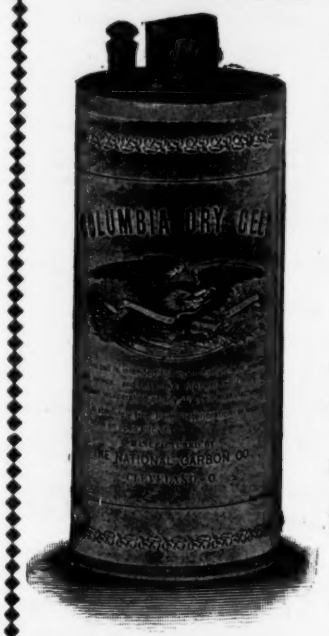

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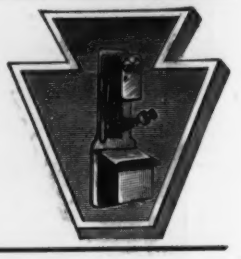

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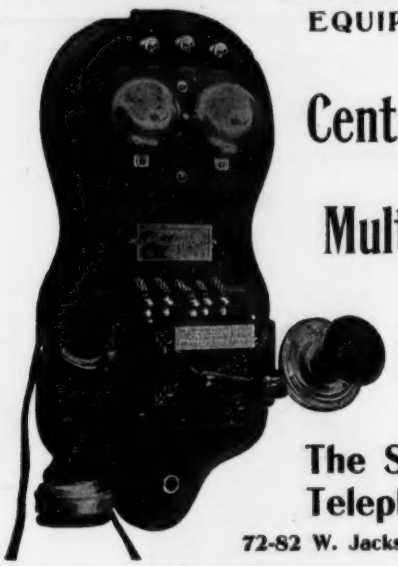

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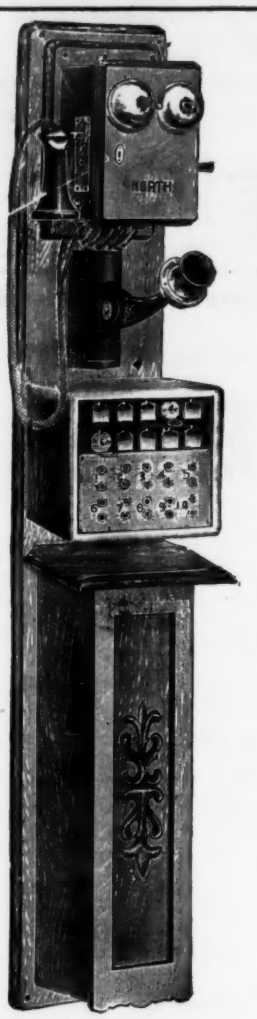

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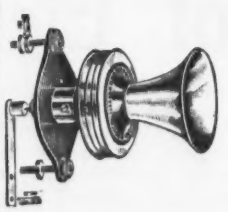

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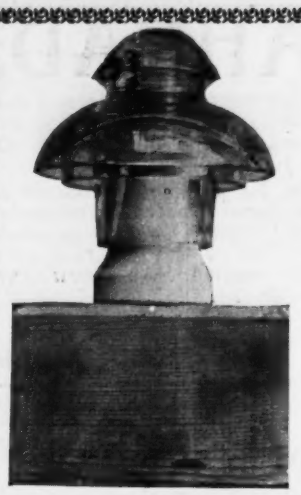

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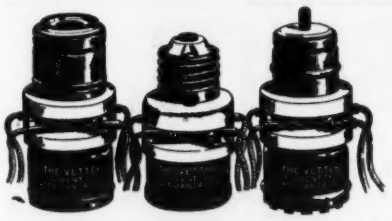

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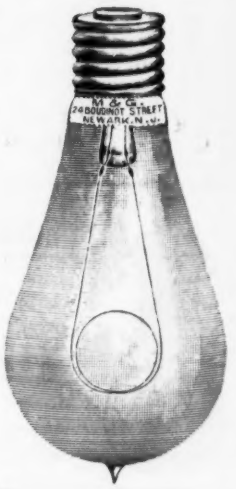

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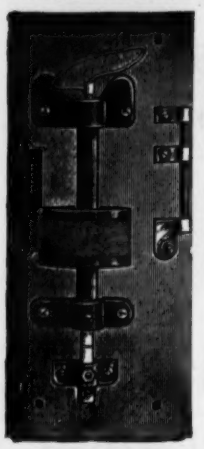

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